9-6920-442-14+P

TM 9-6920-442-14&P

SUPERCEDES COPY DATED 18 NOVEMBER 1983
SEE PAGE i FOR DETAILS

TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST INCLUDING DEPOT LEVEL REPAIR PARTS

FOR

TARGET HOLDING MECHANISM, TANK GUNNERY (THM/TG)
(NSN 6920-01-085-8514)
(PN 11784501)
(NSN 6920-01-M23-2987)
(PN 9375764)
(NSN 6920-01-165-4564)
(PN 11784502)

Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY

DECEMBER 1987

D 101.11:

READEX FICHE best copy available

WARNING

High voltage is used in the operation of this equipment. Death on contact may result if personnel fail to observe safety precautions.

WARNING

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

WARNING

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous charge. When working inside the equipment, after the power has been turned off, always ground every part before touching it.

WARNING

Be careful not to contact high-voltage connections of 115 VAC input connections when installing or operating this equipment.

WARNING

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body. Do not be mislead by the term "Low Voltage." Potential voltage as low as 50 volts may cause death under adverse conditions. For artificial respirations, refer to FM 21-11.

TECHNICAL MANUAL

NO. 9-6920-442-14&P

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C. 29 DECEMBER 1987

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST TO INCLUDE DEPOT LEVEL REPAIR PARTS

FOR

TARGET HOLDING MECHANISM/TANK GUNNERY
CURRENT AS OF 1 JANUARY 1987

Approved for public release; distribution is unlimited.

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes, or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2, located in the back of this manual, direct to: Commander, U.S. Army Munitions & Chemical Command, Attn: AMSMC-MAS, Rock Island, Illinois, 61299-6000. A reply will be furnished to you.

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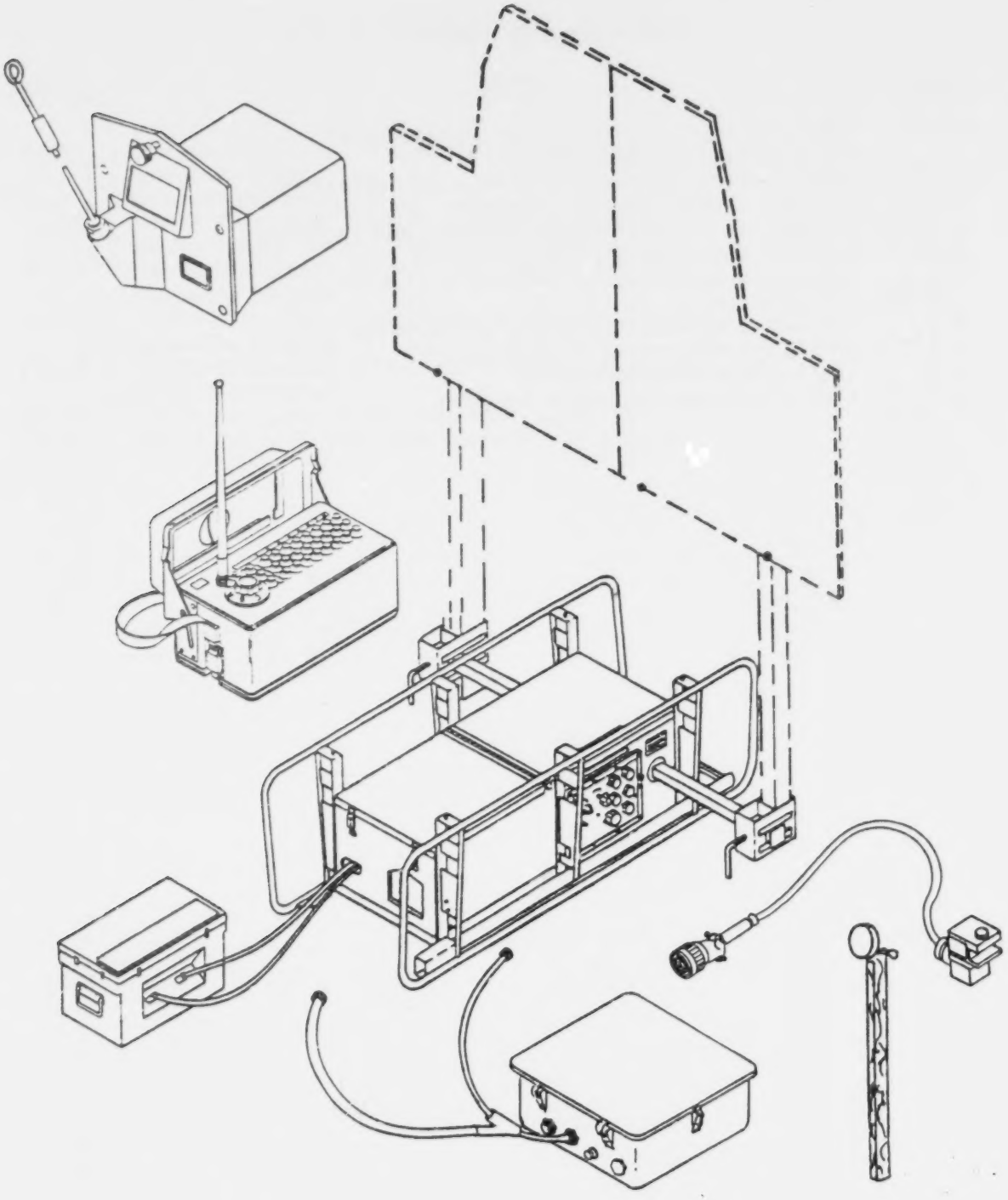


Figure 1-1. Target Holding Mechanism/Tank Gunnery

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. SCOPE. This maintenance manual is for the operator, organizational, direct support (DS), and general support (GS) personnel responsible for operation and maintenance of the Target Holding Mechanism/Tank Gunnery (THM/TG). The information presented herein describes in detail the operating procedures and the maintenance allocated to operator, organizational, direct support, and general support maintenance as indicated by the Maintenance Allocation Chart (MAC). Appendix A contains a listing of reference materials for this manual, and Appendix B contains the Maintenance Allocation Chart (MAC); Appendix C contains the Repair Parts and Special Tools List (RPSTL). Appendix D contains the expendable/durable supplies.

1-2. FORMS AND RECORDS. Maintenance forms, records, and reports which are to be used by maintenance personnel at all levels are listed in and prescribed by DA PAM 738-750.

1-3. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR). If your THM/TG needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to us at: Commander, U.S. Army Armament Munitions and Chemical Command, Attn: AMSMC-QAD, Rock Island, IL 61299-6000. We will send you a reply.

1-4. RANGE INSTALLATION. Refer to figure 1-2 for a depiction of a typical range installation of the THM/TG.

Section II. DESCRIPTION AND DATA

1-5. DESCRIPTION. The Target Holding Mechanism/Tank Gunnery (THM/TG) can be used in two different configurations. The first configuration (PN11784501) (figure 1-1), consists of the THM/TG and a receiver. The receiver interfaces with the Operator Control Device/Transmitter (OCD) which is used to remotely control the target holding mechanism. The second configuration, (PN 9375764, less Target Interface Unit) (figure 1-1), is integrated with the Remoted Target Systems (RETS) Range Control Station (RCS). This is accomplished through the Target Interface Unit (TIU) which allows for remote control of the THM/TG by the Remoted Target System computer.

a. Target Holding Mechanism/Tank Gunnery. The THM/TG is an electro-mechanical-hydraulic device that raises and lowers attached targets and is operated by the OCD and receiver, or the Range Control Station (RCS). Targets are raised and lowered through a 90 degree arc. A hit sensor is attached to the target to sense target hits. When the target is hit by a munitions projectile the target response will be based on the target device FUNCTION switch setting. A hostile fire simulator, Target Kill Simulator (TKS), and/or

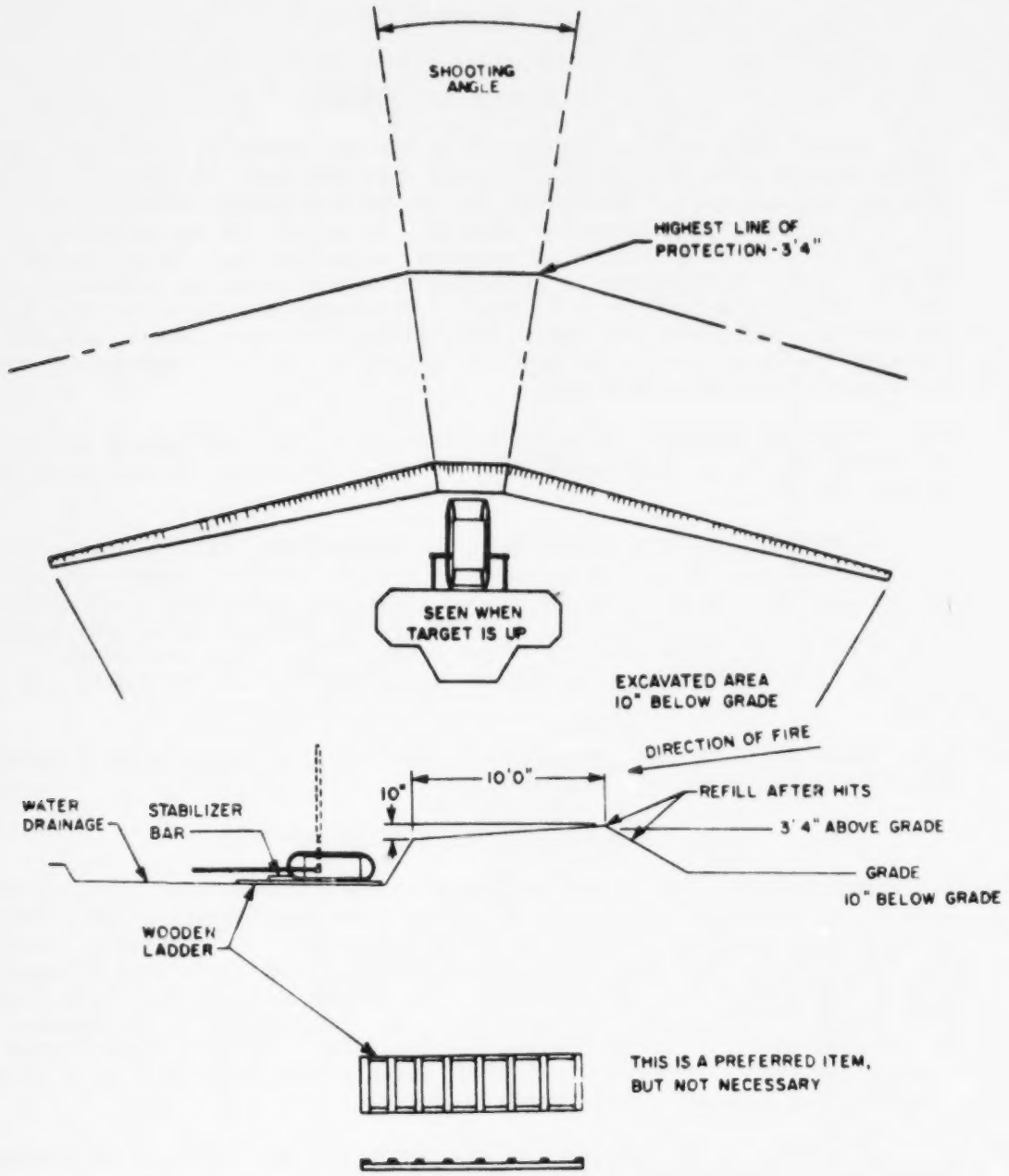


Figure 1-2. Range Installation

Lamp Assembly may be attached to the THM/TG Electronic Control Unit. The hostile fire simulator, if attached, may be activated remotely by the OCD or RCS. When the target is hit the Lamp Assembly, if attached, will flash and the TKS, if attached, will detonate a pyrotechnic charge. The THM/TG is a portable device which may be used in fixed positions. Each THM/TG is equipped with a 12 volt battery making it capable of operations independent of an external power source.

b. Operator Control Device/Transmitter. The OCD is a portable remote control device consisting of a transmitter/control device, a rechargeable battery, and a removable antenna. The OCD has five frequency channels designated A through E. Individual channel selections, or combinations of selections are assigned by a removable channel selector knob that also functions as a key since the OCD cannot be operated without the knob being in place. The detachable knob has ten different designs. A channel marked A can only be used on channel A, while a knob marked C-E can be used only for channels C, D, and E.

The front panel of the OCD permits the transmission of FIRE, UP, and DOWN commands to up to 40 receivers, individually or in groups. There are eight columns of pushbuttons and each column has a pushbutton for each command. There is also another column of pushbuttons which commands all eight receivers simultaneously.

c. Target Interface Unit (TIU). The TIU receives encoded target control data from the RCS and decodes it into control signals used by the THM/TG. A current limited power source is provided by the TIU to maintain the charge on the battery in the THM/TG. The TIU also encodes and sends status and hit information from the THM/TG to the Range Control Station.

1-6. THM/TG COMPONENTS. The THM/TG is comprised of the following sub-assemblies: (See figure 1-3.)

a. Main Frame

b. Target Arms and Target Clamps

c. Lamp Assembly

d. Electronic Control Unit

e. Receiver

f. Hit Sensors

g. Battery Box

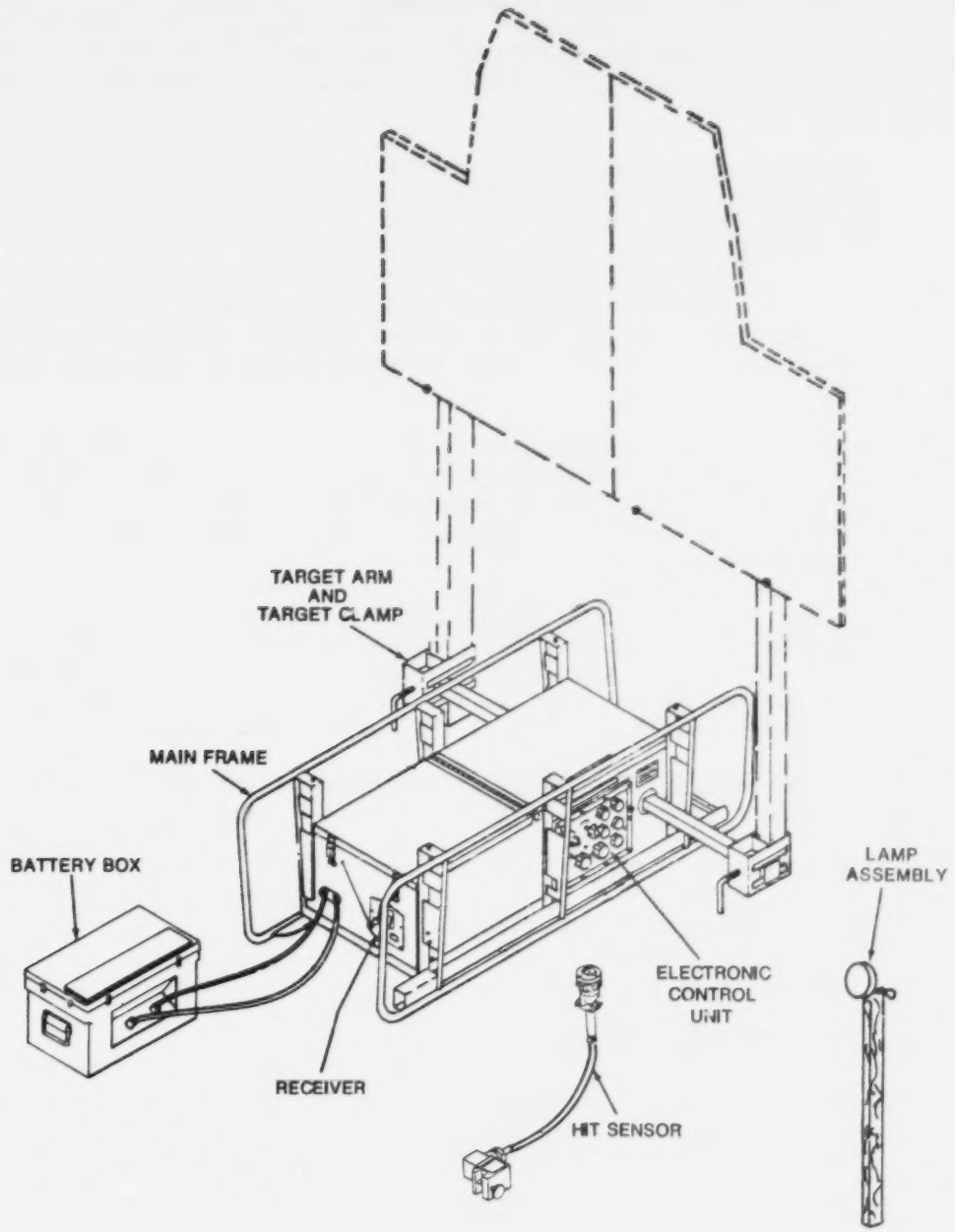


Figure 1-3. Target Holding Mechanism/Tank Gunnery Components

1-7. DESCRIPTION OF COMPONENTS. (See figure 1-3.)

a. Main Frame. The THM/TG consists of two protective frames used as carrying handles, and a housing assembly mounted between the two carrying handles. The carrying handles provide ease in the transportation of the device. The housing assembly contains the electro-hydraulic target elevating mechanism, electronic control unit, and the receiver. The battery box is an external power source which is connected to the THM/TG by two cables. The cover for the housing assembly contains a storage compartment for the hit sensors when they are not in use. A movable stabilizer bar is located under the frame which, when extended, will stabilize the device.

b. Target and Target Clamps. The THM/TG targets are generally constructed of plywood, simulating a tank or tank turret. The target is connected to the THM/TG by two target clamps/target arms. These target clamps/arms are removable, and may be kept in the protective frames (carrying handles) during shipment or storage.

c. Lamp Assembly. The Lamp Assembly is a halogen spotlight which flashes when a hit is registered. The lamp is connected to the Electronic Control Unit by means of a cable approximately 33 feet in length. The Lamp Assembly is equipped with a clamp which permits attachment to a stake or tree. The Lamp is 12V, 50W.

d. Electronic Control Unit. The Electronic Control Unit, in response to target commands, operates the relays that control the solenoid valves and activates the motor and valve assembly, the target kill simulator, and lamp assembly when connected to the device. The panel assembly contains a local TEST switch, a low BATTERY indicator lamp, a SENSITIVITY switch, a FUNCTION switch, and connectors for simulators and hit sensors.

e. Receiver. The Receiver translates command signals from the transmitter into encoded signals which drive the Electronic Control Unit.

f. Hit Sensor. The hit sensor senses the shock wave produced when a projectile strikes the target. The hit sensor is attached to the base of the target. The hit sensor is connected to the THM/TG by a cable approximately 13 feet in length.

g. Battery. A 12 volt lead-acid battery provides DC operating power for the THM/TG. The battery is located in a separate battery box. A nylon rope handle is attached to the battery for easy removal and replacement. The Target Interface Unit provides charging power for the battery when the THM/TG is in the RETS configuration. The Electronic Control Unit FUNCTION switch must be in any position other than O to charge the battery.

1-8. TABULATED DATA. Refer to table 1-1 for a listing of the physical, electrical, and environmental characteristics/limitations of the THM/TG.

Table 1-1. THM/TG Physical, Electrical, and Environmental Characteristics/Limitations

Target Holding Machanism/Tank Gunnery:	
Power Requirements	12 VDC
Environmental:	
Temperature	-25 to +125 F
Relative Humidity	5 to 95 percent
Wind Velocity (Raised Target)	35 mph (maximum)
Weight	Approximately 327 lbs.
Dimensions	55.5" L x 24" W x 18.25" H
Target Arc Radius	90 degrees
Maximum Oil Pressure	2,000 psi
Operator Control Device/Transmitter:	
Power Requirements	12 VDC (NiCad Battery)
Channel Spacing	50 kHz
Frequency Range	138 - 165 MHz
Frequency Tolerance	+ 2.5 kHz
Modulation	Frequency Modulation, FM
Antenna Impedance	50 ohms
Output	6 watts
Operation Range (maximum)	2.5 miles
Number of receivers per channel	8
Number of functions per receiver	3 (FIRE, UP, and DOWN)
Number of channels per frequency group	5
Number of receivers per frequency group	40
Environmental:	
Temperature	-13 to +140 F
Relative Humidity	5 to 95 percent
Weight	Approximately 16.5 lbs.
Dimensions	6.5" L x 12.6" W x 7.1" H
Current Drain:	
Stand-by	< 0.1 mA
Transmitting	1.5A

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. PREPARATION FOR OPERATION

2-1. GENERAL. This section shows the location and describes the function and use of the controls and indicators used on the Target Holding Mechanism/Tank Gunnery, and provides preliminary procedures which are required prior to placing the unit in service.

2-2. CONTROLS AND INDICATORS. Controls and indicators on the THM/TG and the Operator Control Device/Transmitter (OCD) are illustrated in tables 2-1 and 2-2, and figures 2-1 and 2-2.

2-3. PRELIMINARY INSPECTION. Make the following checks to ensure that the THM/TG, OCD, and TIU are in a serviceable condition. These checks are to be made any time these devices are placed in service on a range.

WARNING

Remove power from the THM/TG before performing any procedures on this equipment. Failure to do so could result in severe injury and/or death.

a. Operator Control Device/Transmitter.

(1) Ensure that the correct Channel Select knob is installed.

(2) Ensure that the Channel Select letters on the OCD match those letters on the receiver.

(3) Ensure that the frequency group letters of the OCD and the receiver are the same.

(4) To remove the battery from the transmitter case, release the two latches securing the bottom cover. The battery can then be removed by loosening the holding screws and lifting out the battery.

NOTE

Reference TM-11-6140-302-14-1 and TM-11-6140-203-14-3 for charging and discharging NiCad batteries.

(5) The battery can be charged by the following steps.

(a) Ensure that the battery charger terminals are clean.

(b) Ensure that the battery connections are free of dirt and corrosion.

(c) Place the battery on the charger terminals.

(d) Ensure that the charger POWER lamp is ON.

(e) Set the CHARGER timer to the desired charging time and the CHARGING lamp should illuminate.

(f) When the battery is fully charged, the CHARGING lamp will dim.

NOTE

Check the temperature of the battery during charging. If the battery feels warm (+90 degrees F), stop charging.

(6) Install the battery by pressing it into the transmitter. Ensure that the battery terminals make good contact with the transmitter terminals. Tighten the battery holding screws. Replace the bottom cover and secure with latches.

CAUTION

The OCD must not be used without the antenna or equipment damage may result.

(7) Ensure that the OCD is equipped with an antenna, and that the antenna is properly secured. (See figure 4-2.)

b. Target Holding Mechanism/Tank Gunnery.

(1) Check the target for serviceability.

(2) Ensure that the target path is clear of obstructions.

(3) Inspect the target arm mounting clamps for serviceability.

(4) Check the hit sensor to ensure that it is securely attached to the target and is not damaged.

(5) Inspect power/battery cable(s) for tight connection and/or visible signs of damage.

(6) Inspect for the following conditions:

(a) Housing and cover are not damaged.

(b) The Electronic Control Unit is securely mounted.

Table 2-1. Target Holding Mechanism Controls and Indicators
(See figure 2-1)

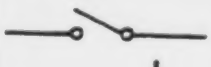
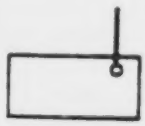
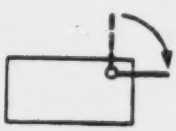
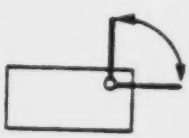
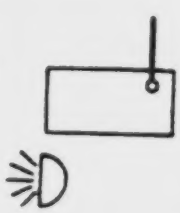
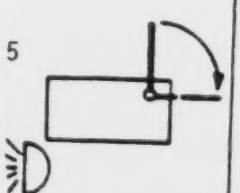
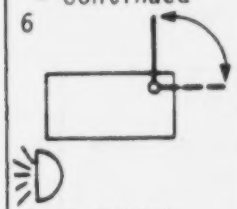
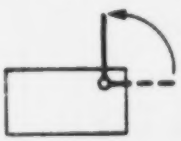
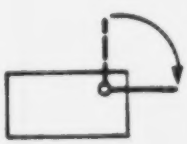
Item	Name	Function	Operating Position
1	Function Switch	Selects six different operating functions, and an OFF position.	
		Internal power is OFF.	OFF
	1 	Target remains in the UP position when hit and the TKS is activated.	1
	2 	Target automatically goes DOWN when hit remains in the DOWN position. TKS is activated.	2
	3 	Target automatically goes DOWN when hit and then automatically goes to UP position with 12 seconds. TKS is activated.	3
	4 	Target remains UP when hit. TKS is activated. Lamp Assembly flashes.	4
	5 	Target automatically goes DOWN when hit and remains in DOWN position. TKS is activated and Lamp Assembly will flash.	5

TABLE 2-1. Target Holding Mechanism Controls and Indicators - Continued

Item	Name	Function	Operating Position
1	Function Switch - Continued 6 	Target automatically goes DOWN when hit and then automatically moves to UP position within 12 seconds. TKS is activated and LAMP Assembly will flash.	6
2	Test Switch 	Test the operation of the target UP and DOWN circuitry. Target firing circuits are inactive to eliminate the risk of accidentally firing the TKS.	UP
		Test the operation of the target DOWN circuitry. Target firing circuits are inactive to eliminate the risk of accidentally firing the TKS.	DOWN
3	Sensitivity Switch	Allows for accurate hit sensing capability for several types of ammunition. (Only non-explosive ammunition will be used.)	1 through 4
4	Battery Lamp	Indicates condition of battery charge level. Lamp illuminates when target arm is being raised or lowered if battery is properly charged. Lamp flashes during target arm movement if battery requires charge.	Illuminated
5	Smoke Scorer	Connector for the Target Interface Unit.	
6	Hostile Fire Simulator	Connector for the Target Kill Simulator (TKS).	
7	Lamp	Connector for the Lamp Assembly	
8	Hit Sensor	Four connectors for the Hit Sensors mounted on the target.	

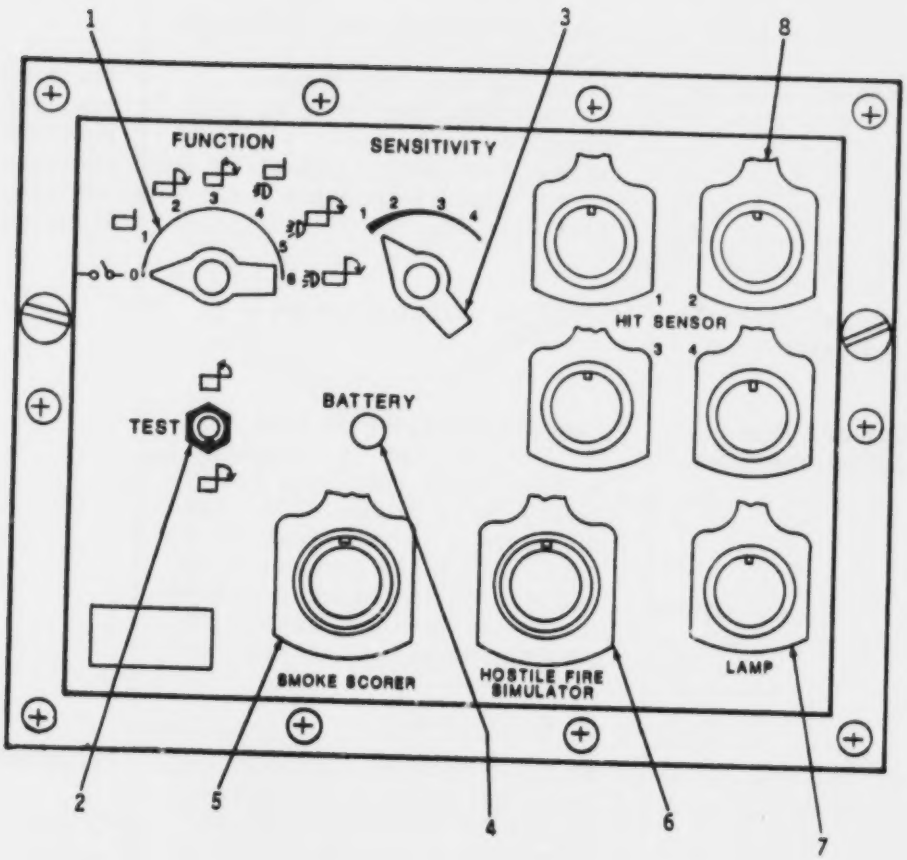


Figure 2-1. THM/TG Controls and Indicators

Table 2-2. Operator Control Device (Transmitter)
(See figure 2-2.)

NOTE

Frequency of the transmitter channel must match the receiver frequency.

Item	Name	Function	Operating Position
1	Frequency Decal	Identifies transmitter frequency.	
2	Channel Selector	Selects the frequency channel either individually or in combinations. The knob is detachable. Transmitter cannot be used unless knob is in place. Position 0 is for the off position.	Position 0 Position A Position B Position C Position D Position E
3	Channel Selected Indicator	Identifies selected channel.	
4	Command Pushbutton Switches	Allows transmitting of FIRE ⩙, UP ↑, or DOWN ↓ commands to as many as 40 receivers individually or in groups of 8. The pushbuttons to the right of the signs select the command to be transmitted individually. Pushbuttons to the left select the commands to all eight receiver groups.	
5	RF/Battery Indicator	When a pushbutton is pressed and the light flashes, low battery voltage is indicated. Steady illumination indicates transmission of commands.	Illuminated

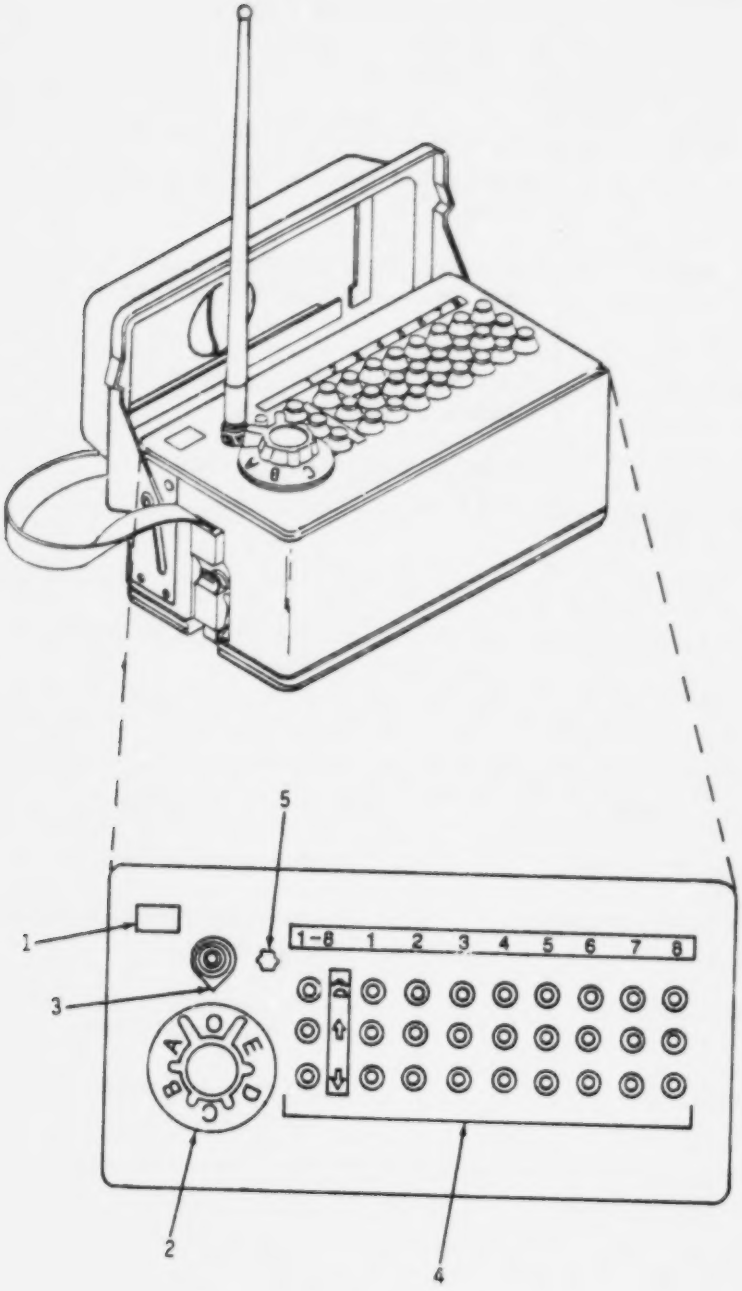


Figure 2-2. Operator Control Device/Transmitter Controls and Indicators

Table 2-3. Transmitter Battery Charger Controls and Indicators (See Figure 2-3)

Item	Name	Function	Operating Position
1	Timer	Selects the desired battery charge time.	1-13 hours
2	Power Lamp	Indicates that external power has been applied to the battery charger.	Illuminated
3	Charge Lamp	Indicates that the battery is being charged.	Illuminated
4	Fuse	Protects input transformer	

Table 2-4. Receiver Unit Controls and Indicators (See Figure 2-4)

Item	Name	Function
1	Antenna Socket	Mounting of Antenna
2	Frequency Address Decal	Identifies receiver frequency and address.
3	J1 Connector	Cable connector for connection to electronic unit.
4	Dessicator	Indicates moisture level inside receiver.

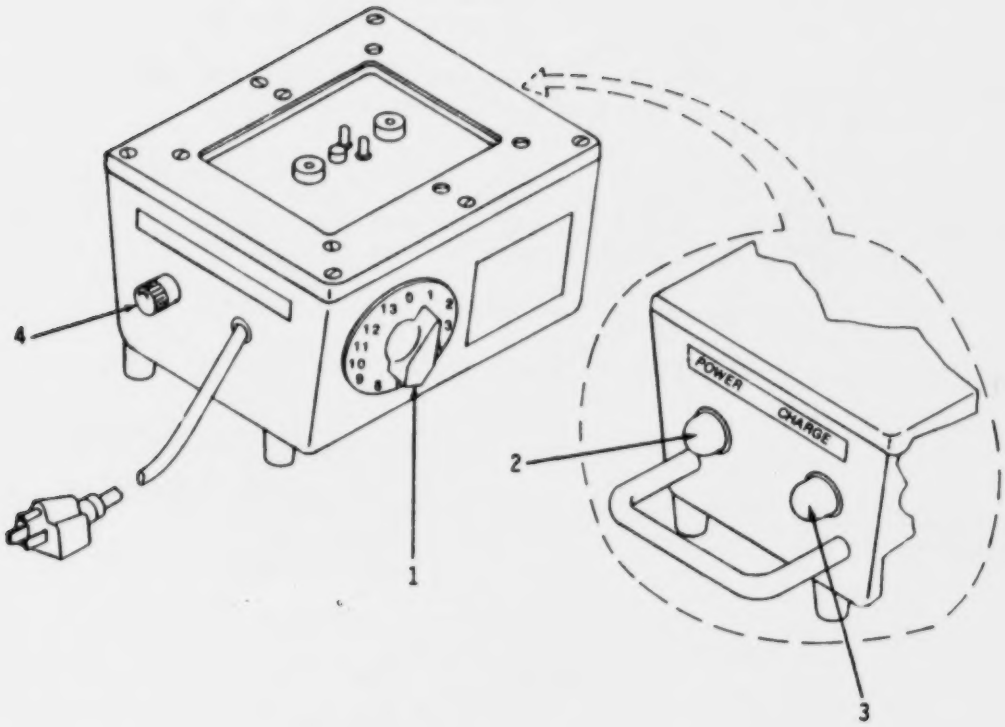


Figure 2-3. Battery Charger Controls and Indicators

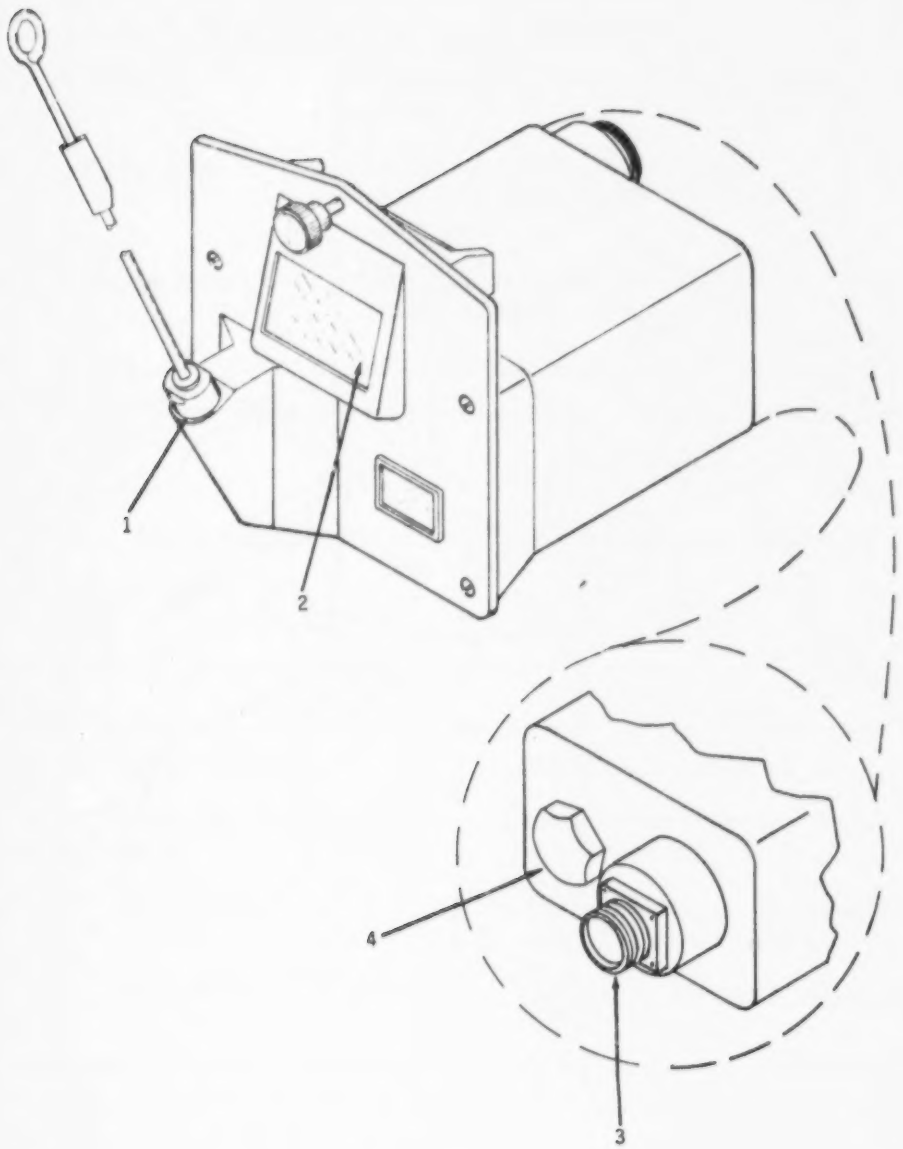


Figure 2-4. Receiver Unit Controls and Indicators

(c) If OCD is used, check that the receiver is securely mounted.

(d) Hit sensor, TKS, and Lamp Assembly (LA) cables are not damaged and are securely connected to the Electronics Control Unit.

(e) Hit sensitivity (reference tables 2-1 and 2-2) and function select switches are properly set.

(7) In the RETS configuration, ensure that the THM/TG is connected to the TIU in accordance with paragraph 4-3b.

(8) The Sensitivity Switch on the Electronic Control Unit should be set to the position that provides the best hit results.

c. Receiver Unit.

(1) Inspect the receiver to ensure that the frequency group letters and address are the same as those assigned the OCD.

(2) Ensure that the antenna is properly mounted.

(3) Inspect the receiver cables to ensure that they are properly connected.

2-4. WARMUP. No warmup of the THM/TG is required.

2-5. OPERATIONAL CHECKOUT. Operational checkout of the THM/TG requires the use of the TEST switch, the Range Control Station (RCS), and/or the Operator Control Device/Transmitter (OCD).

a. THM/TG Test Switch.

WARNING

Ensure that the Target Kill Simulator (TKS) or any other hostile fire simulator is not connected to the device when testing the system.

WARNING

When operating the TEST switch (see figure 2-1), stand clear of the target and target arms. Failure to do so may result in personnel injury.

CAUTION

Ensure that the target movement area is free of obstruction. Failure to do so may result in equipment damage.

(1) Set the FUNCTION switch to position 2.

(2) Raise and lower the target using the TEST switch. Hold the TEST switch for 1 to 2 seconds in each switch position.

(3) Holding the TEST switch in the up position, check that the Lamp Assembly flashes.

(4) Set the SENSITIVITY switch to position 1. Strike the edge of the target near the hit sensor and the target should move to the down position, and remain down. Repeat this procedure with each switch setting and note the change in sensitivity. The hit sensors are most sensitive in position 1, and least sensitive in position 4.

(5) Raise the target using the TEST switch.

(6) Set the FUNCTION switch to position 3 and simulate a hit on the target. The target should lower; then automatically raise in less than 12 seconds.

b. Operator Control Device/Transmitter (OCD). Using the OCD, command the THM/TG to raise and lower the target. Ensure that the Channel Selector on the OCD is properly set before transmitting commands to the THM/TG.

c. Range Control Stations (RCS). If the THM/TG is RCS controlled, use the procedures in TM 9-6920-742-10 (Operating Procedures - Manual Mode), and manually exercise the THM/TG and all simulators. All functions of the THM/TG and its simulators should operate properly.

Section II. OPERATION OF THE THM/TG

2-6. PREOPERATIONAL PROCEDURES.

a. Target Holding Mechanism/Tank Gunnery. Prior to operation of the THM/TG, ensure that the battery is fully charged and that the power/battery cables are securely and properly connected.

b. Operator Control Device/Transmitter. Prior to operating the OCD, ensure that the battery is fully charged. The battery condition can be determined by checking the status of the RF/battery lamp. If the voltage is low, the lamp will flash when a pushbutton is pressed.

c. Target Interface Unit. Before operating the THM/TG with the Remoted Target System, ensure that the TIU circuit breaker is set to ON and the address switch is set correctly (reference TM 9-6920-742-14&P-1).

2-7. OPERATIONAL PROCEDURES. The THM/TG may be performed by using the OCD or the RCS.

NOTE

Prior to operating the THM/TG, ensure that the FUNCTION switch and SENSITIVITY switch are set to the desired settings.

WARNING

Do not leave the OCD unattended with the Channel Select knob attached. Otherwise, there is a risk that the target kill simulators may be inadvertently fired or the target may be raised or lowered by accidentally pressing a pushbutton.

a. Operator Control Device/Transmitter. Operation of the THM/TG with the OCD involves the use of the pushbuttons. These pushbuttons control target up and down movement, and the firing of the target kill simulators. The pushbutton on the OCD must be pressed for at least one second. Button column 1-8 activates all receivers on the set channel; button column 1 activates receiver 1, etc. The first row of buttons activates the FIRE command for the Target Kill Simulator. The next two rows control the target UP and DOWN commands.

b. Range Control Stations. Refer to TM 9-6920-742-10 for operation procedures involving the RCS.

2-8. POST-OPERATIONAL PROCEDURES.

a. Operator Control Device/Transmitter.

(1) Turn the channel selector knob to zero and store the antenna.

(3) Remove the battery from the transmitter, and charge the battery (reference Table 2-3).

(4) Store the device to protect it from inclement weather when not in use.

b. Target Holding Mechanism/Tank Gunnery.

(1) If the THM/TG is to remain on-site, perform the following:

(a) Check the device for damage.

(b) Place protective covers on the Electronic Control Unit connectors not in use.

(c) Set the FUNCTION switch in position 4 and lower the target with the Electronic Control Unit TEST switch.

(d) If the THM/TG is connected to the Target Interface Unit, ensure that the Electronic Control Unit FUNCTION switch is in position 4.

NOTE

The TIU cannot charge the THM/TG battery if the Electronic Control Unit FUNCTION switch is set to 0.

(e) Ensure that the TIU circuit breaker is ON.

(2) If the THM/TG is to be evacuated from the range, perform the following:

WARNING

Before performing the following procedures set the FUNCTION switch to the 0 position; then set the TKS arm switch to the down position and disconnect the TKS cable. Failure to do so may result in the accidental firing of these devices.

(a) Disconnect the battery cables from the THM/TG.

(b) Disconnect the Lamp Assembly and the TKS.

(c) Remove the hit sensors.

(d) Remove the target and target arms. Place the target arms in the THM/TG protective frame (carrying handles).

(e) Ensure that the cover is closed and secured.

(f) Remove any dirt and/or moisture from the device.

(g) If the THM/TG is connected to the TIU, set the TIU circuit breaker to OFF and remove the W107 cable.

(h) Remove the device from the range.

CAUTION

The THM/TG must be transported in the normal operating position or damage could occur due to loss of hydraulic fluid.

(3) If the THM/TG 12 VDC battery requires charging, perform the following procedure.

CAUTION

Bare metal tools should not be used due to potential short circuit damage to the battery. Metal tools intended for servicing batteries must be insulated.

WARNING

Use protective clothing, rubber gloves and protective goggles when cleaning or removing the battery. The electrolyte in the battery will burn skin and clothing. Any electrolyte splashed on the skin should be immediately removed with running water, and neutralized with a baking soda solution. Any electrolyte splashed into the eyes should be rinsed out with water. If the latter occurs, seek immediate medical attention.

(a) Disconnect the black cable and then the red cable from the battery box by pulling out.

(b) Lift the latches on the battery box and remove the lid.

(c) Disconnect the black (negative) battery cable from the battery terminals; then disconnect the red (positive) battery cable.

(d) Lift the battery from the battery box and carry it to a charging facility.

(e) Place the battery on a wooden platform. Ensure that the battery plates are completely covered with electrolyte. If the liquid level is low, add distilled water to cover the plates.

CAUTION

Do not place the battery on a concrete floor before, during, or after charging. Damage to the battery will result.

CAUTION

Before plugging in the battery charger, ensure that the battery is connected with the correct polarity. Reversed polarity may destroy the battery.

(f) Connect battery charger leads.

(g) Install the charged battery into the battery box. First connect the red (positive) battery cable; then connect the black (negative) battery cable.

(h) Replace the lid.

(i) Reconnect red (positive) external power cable to battery box; then connect the black cable.

CHAPTER 3

OPERATOR/CREW MAINTENANCE INSTRUCTIONS

3-1. INTRODUCTION. This section describes preventive maintenance checks and services (PMCS) which must be performed by operator personnel in order to maintain the Target Holding Mechanism/Tank Gunnery (THM/TG) and the Operator Control Device/Transmitter (OCD) in an operational condition. Preventive maintenance includes cleaning and inspection procedures. Such procedures are performed regularly, to detect conditions which might cause the performance of the equipment to deteriorate, or cause equipment failure. The operator should notify the appropriate maintenance level if such conditions are identified.

3-2. PREVENTIVE MAINTENANCE CHECKS AND SERVICES. Refer to table 3-1 for preventive maintenance checks for the THM/TG and OCD. Perform those actions in the "D" column daily, the "W" column weekly, and the "M" column monthly.

3-3. CLEANING. The THM/TG and OCD should always be kept clean or performance may be degraded, and relatively obvious defects that would be noticed in visual inspection may be hidden by dust, dirt, or other foreign matter. Refer to Appendix D for a listing of expendable/durable supplies.

WARNING

Denatured alcohol is flammable. Keep all flammable cleaning materials away from open flames. Failure to do so could result in serious injury or death.

a. Metal Parts. Use dry clean wiping cloths to remove dust, dirt, and moisture, or other foreign matter from the THM/TG and OCD. If foreign matter cannot be removed using dry wiping cloths, dampen a cloth with alcohol or water and gently wipe the area.

CAUTION

Do not get alcohol on any rubber parts or sealants. Alcohol may cause rubber parts to deteriorate, and some sealants to dissolve. Do not clean using high pressure water, this may cause damage to the equipment.

b. Rubber Parts. Use dry clean wiping cloths to remove dust, dirt, and moisture, or other foreign matter.

c. Plastic Parts. Use clean dampened wiping cloths to clean dust, dirt, and other debris from plastic parts. Dry the parts using a clean, absorbent cloth.

Table 3-1. Operator/Crew Preventive Maintenance Checks and Services

D - Daily Time Required: 2.4 | W - Weekly Time Required: 0 | M - Monthly Time Required: 1.1

Interval & Sequence No. D	W	M	Item to be Inspected Procedure	Work Time (M/H)
			TARGET HOLDING MECHANISM/TANK GUNNERY	
1			Check the water level in the battery.	0.1
2			Check that the battery connections are tight.	0.1
		1	Check the battery box and clean if necessary.	0.9
3			Check all cable connections for tightness and visible signs of damage.	0.1
		2	Check exterior finish for scratches and bare metal areas. Touch up using paint No. 34087, color olive drab per Fed. Std. 595.	0.2
			RECEIVER	
1			Check to ensure that the frequency group designation on the receiver corresponds with the selected OCD.	0.2
2			Check that the receiver's antenna is firmly seated and is not damaged.	0.2
3			Check receiver to ensure that it is secured to the THM/TG.	0.1
4			Check to ensure that the receiver antenna socket drainage hole is not clogged or blocked with dirt or foreign matter.	0.2
			OPERATOR CONTROL DEVICE/TRANSMITTER	
1			Check that the frequency group designation on the OCD corresponds with the selection on the Receiver.	0.2
2			Check that the antenna is firmly screwed into the connector and that it is not damaged.	0.2

Table 3-1. Operator/Crew Preventive Maintenance Checks and Services - Continued

D - Daily Time Required: 2.4 | W - Weekly Time Required: 0 | M - Monthly Time Required: 1.1

Interval & Sequence No. D	W	M	Item to be Inspected Procedure	Work Time (M/H)
3			Check that the OCD Channel Select knob is in place, and that the letters on the knob corresponds to the correct frequency group.	0.2
4			Check that OCD battery lamp illuminates steadily while a pushbutton is pressed. A flashing light indicates that the battery needs to be charged.	0.2
5			Check that the target mechanism raises and lowers the targets as commanded.	0.2
6			Ensure that the OCD battery is fully charged.	0.2

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

4-1. SERVICE AND INSPECTION. Service upon receipt of equipment consists of a visual check to ensure that hardware is complete and serviceable.

4-2. INSTALLATION. Installation of the Target Holding Mechanism/Tank Gunnery (THM/TG) and the Operator Control Device/Transmitter (OCD) consists of site selection and emplacement procedures.

a. Target Holding Mechanism/Tank Gunnery.

(1) Place THM/TG, Lamp Assembly (LA), and Target Kill Simulator (TKS) in a well protected and drained emplacement.

(2) Ensure that the target path is free of all obstructions or anything that may hinder target movement.

(3) Connect target arms to THM/TG housing, ensuring that target arms fit properly to the guide in the housing.

(4) Secure the target to the target arm mounting clamps. Ensure that the target is centered and that the clamp screws are tight.

CAUTION

Ensure that the FUNCTION switch is set to position O prior to performing the following procedures.

(5) Connect the hit sensor and LA to the THM/TG Electronic Control Unit.

NOTE

The number of hit sensors needed on a target varies with the size and shape of that target. Targets constructed of more than one section should have one hit sensor attached to each section.

Hit sensors should be affixed to the lower edge of each target section, and cables should be placed so that they are not damaged during target movement.

NOTE

The following procedures are to be used when the THM/TG is to be operated remotely by the OCD.

(6) Connect a receiver to the THM/TG by connecting the special purpose cable between receiver J1 and Electronic Control Unit P1. Ensure that the receiver locking knob is in place and that it is fastened to the target mechanism.

(7) Connect the receiver antenna to the receiver. Extend the receiver antenna (reference figure 4-1).

(8) Connect the TKS to the THM/TG Electronic Control Unit

b. Operator Control Device/Transmitter.

NOTE

The OCD should be placed in a controlled location, providing a clear view of the target area. The OCD should be no closer than 150 feet to any receiver.

CAUTION

The OCD should be at least 150 ft. from receivers with other channels selected. Other OCDs with high output in the vicinity of the channel frequency selected should not be used simultaneously with remote control equipment. Damage to the receivers may result.

(1) Install the battery in the OCD.

(2) Open the OCD cover and mount the antenna (reference figure 4-2). Ensure that the antenna does not rotate inside the antenna mounting connector as the locking nut is tightened. To prevent this rotation, hold the antenna in the right hand and tighten the locking nut with the left hand. When removing the antenna, perform the same procedure to ensure that the antenna does not rotate.

CAUTION

The OCD must not be operated without an antenna. Damage to the OCD may result.

(3) Connect the appropriate Channel Select Knob to the OCD.

4-3. EQUIPMENT ADAPTATION. The THM/TG may be operated remotely with the OCD, or commanded from the Remoted Target System (RETS) Range Control Station (RCS).

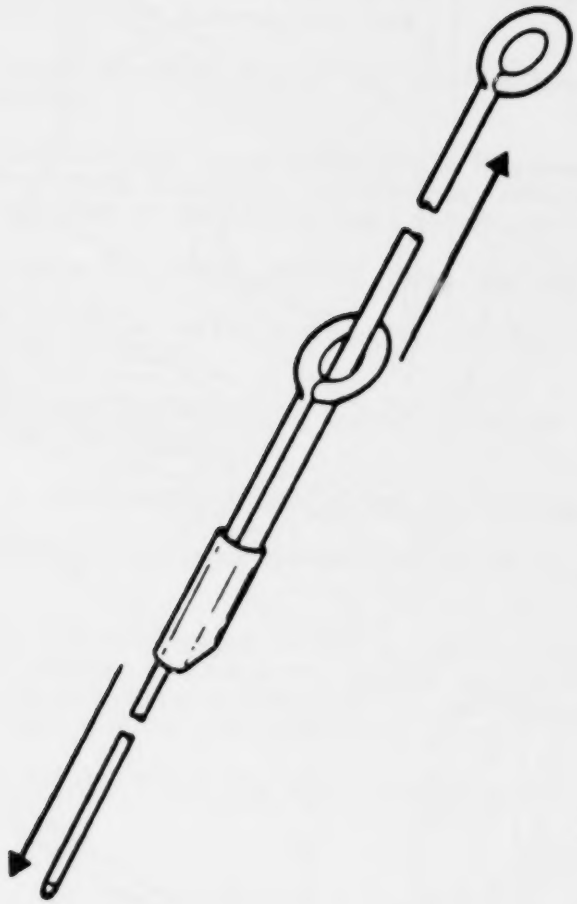


Figure 4-1. Extending Receiver Antenna

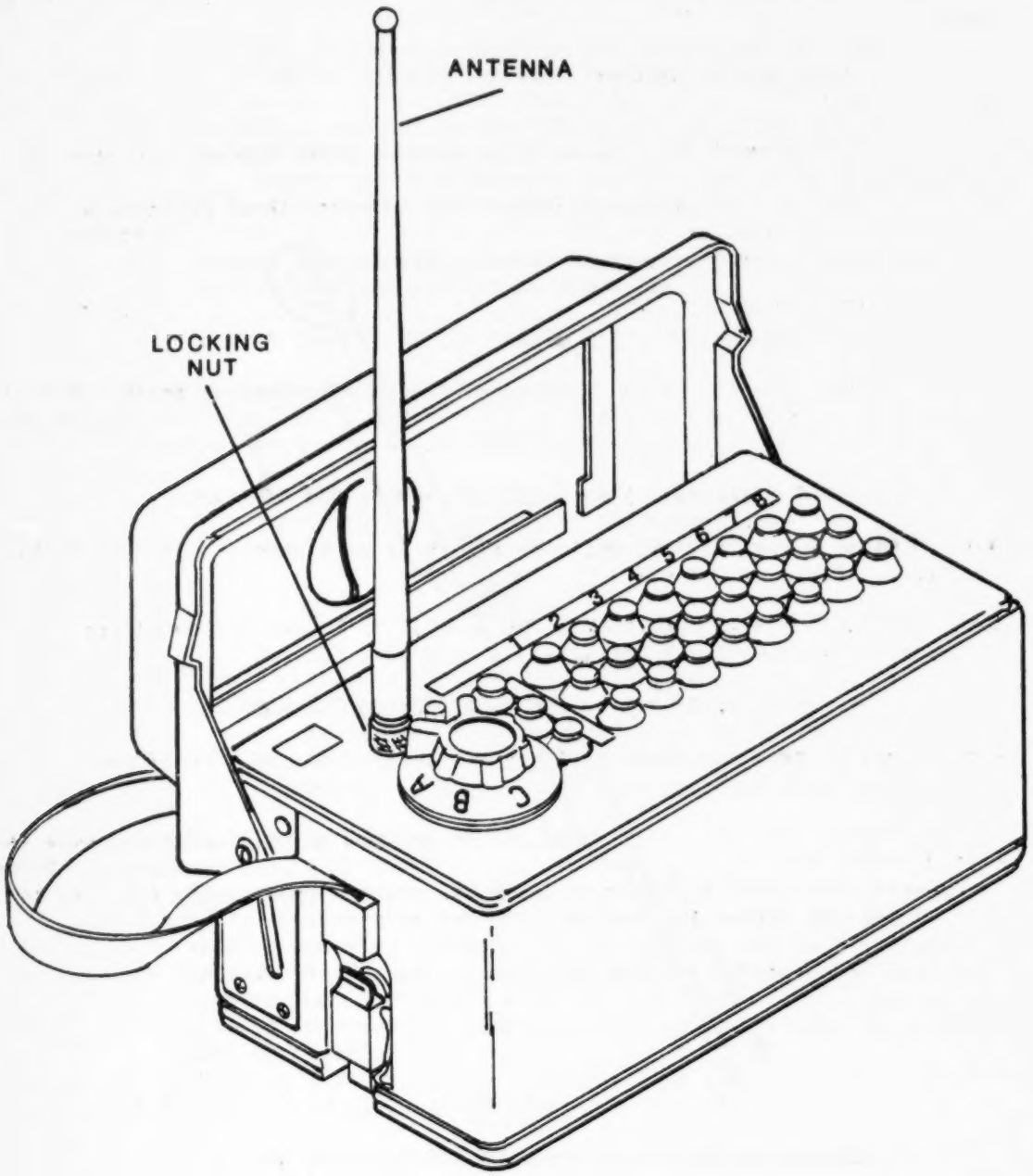


Figure 4-2. Mounting OCD Antenna

a. Operator Control Device/Transmitter. Refer to paragraph 4-2 for OCD setup procedures.

b. Range Control Station. Connect the THM/TG to the RETS Target Interface Unit (TIU) using cable W107 (9363185) as follows:

(1) Connect W107 cable, P1 connector to the TIU at connector J3.

(2) The opposite end of the W107 cable has three connectors. Connector W107, P3 is connected to the THM/TG Electronic Control Unit Smoke Scorer jack.

(3) Insert P2 and P4 through the receiver opening in THM/TG housing.

(4) Connector W107 P2 is connected to P3 connector on the rear of the THM/TG Electronic Control Unit; and connector W107 P4 is connected to the THM/TG limit switch cable connector.

Section II. PARTS, SPECIAL TOOLS, AND EQUIPMENT

4-4. PARTS. For a list of repair parts, refer to Appendix C, Repair Parts and Special Tools List (RPSTL).

4-5. SPECIAL TOOLS AND EQUIPMENT. No special tools and equipment are required to maintain the THM/TG.

Section III. LUBRICATION INSTRUCTIONS

4-6. LUBRICATION. Lubrication of the OCD and THM/TG consists of the following:

a. OCD. The OCD select knob should be lightly lubricated whenever the knob does not turn easily, or once every 30 days when used frequently. Refer to Appendix D, Expendable/Durable Supplies, for the type of lubricant to be used. Refer to Figure 4-3 for the lubrication point.

b. THM/TG Hydraulic Fluid Changing. (See Figure 4-4.)

NOTE

The THM/TG hydraulic fluid should be changed any time the fluid is found to be contaminated.

(1) Lower the target using the THM/TG TEST switch.

(2) Set the FUNCTION switch to the O (off) position.

(3) Remove the housing cover (reference paragraph 4-28(a)) and inspect the two hydraulic hoses connected to ports C1 through C4 for damage or leaks.

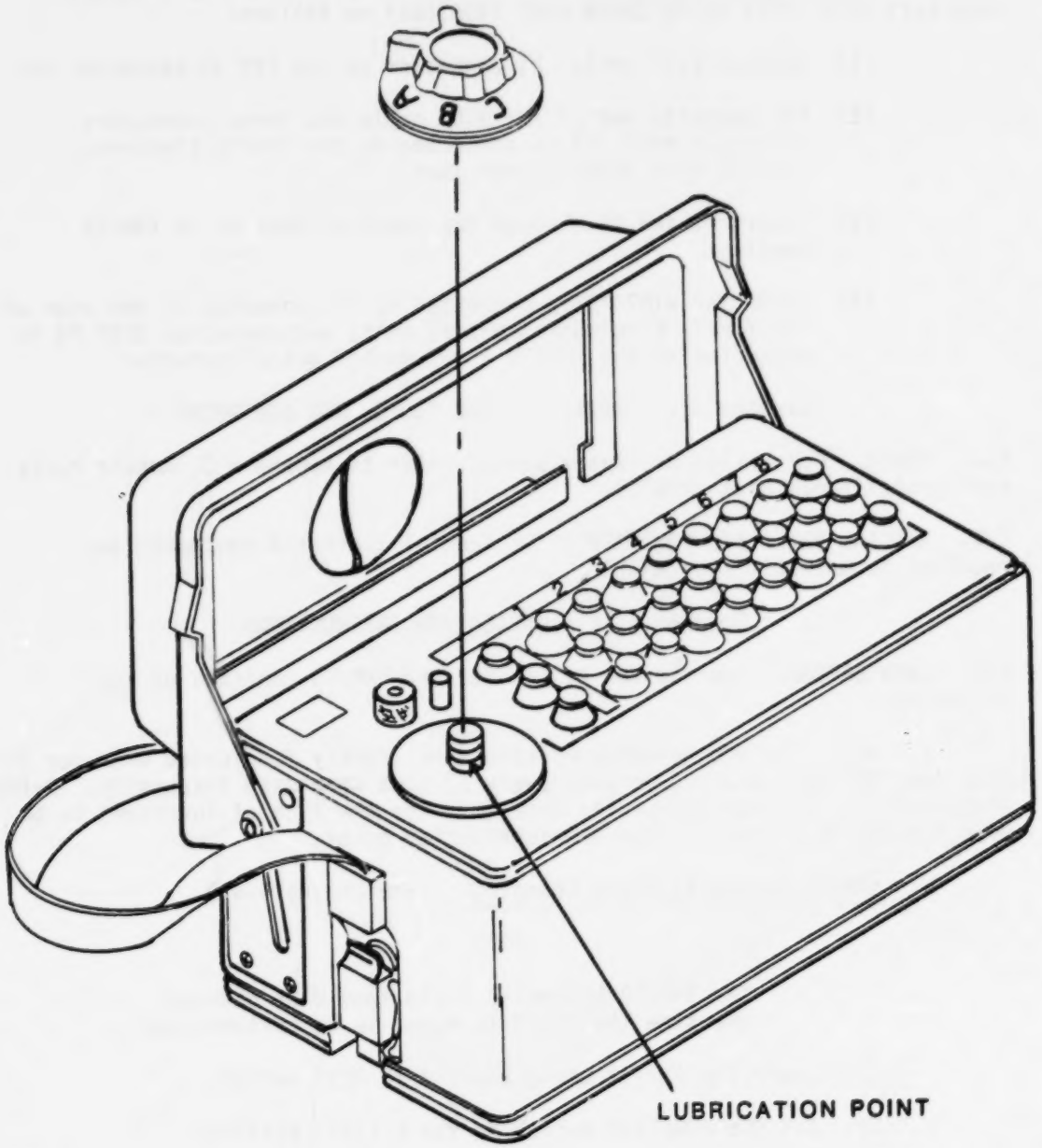


Figure 4-3. OCD Lubrication Point

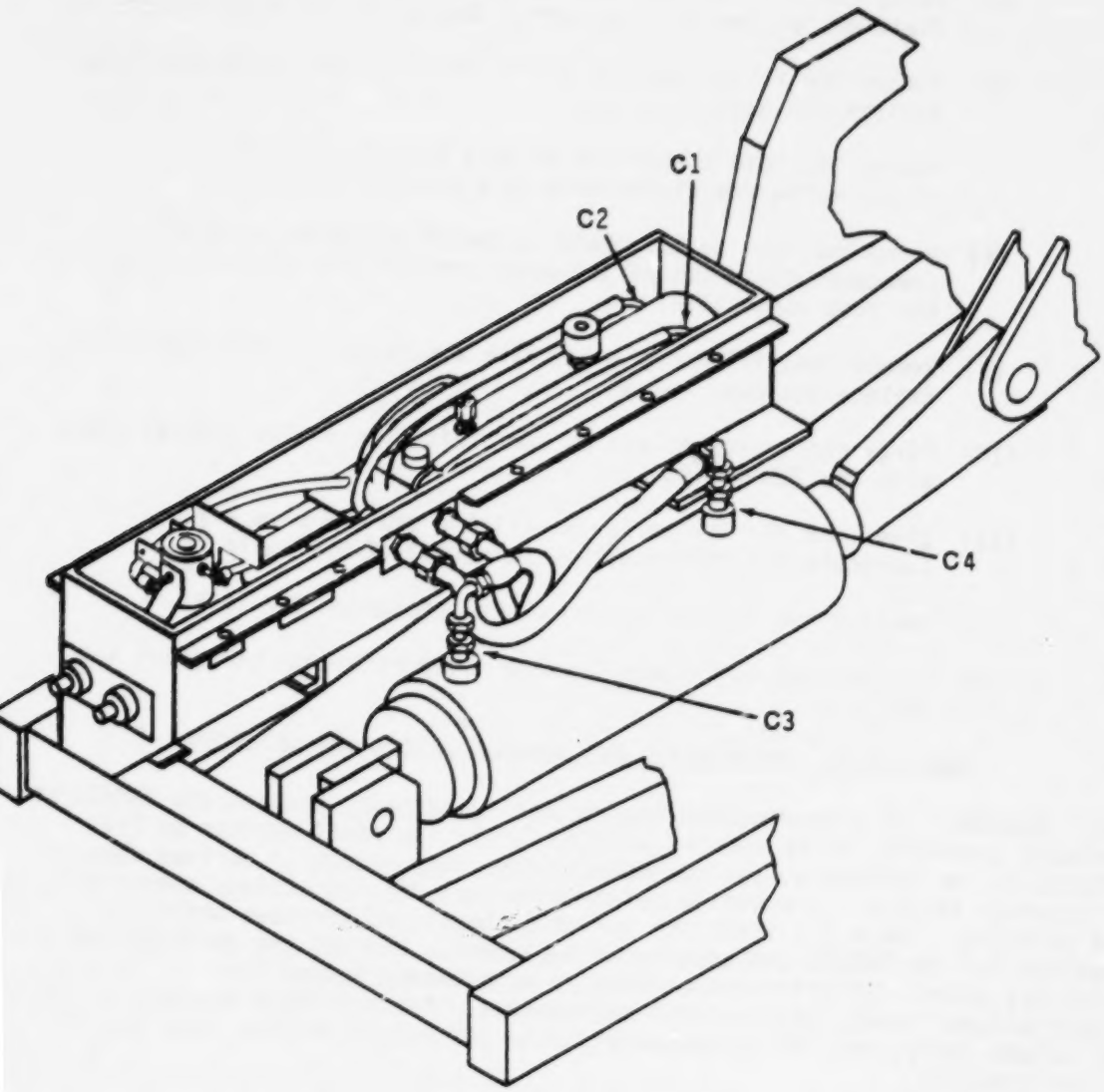


Figure 4-4. THM/TG Fluid Replenishment

(4) Remove the hose connection at port C3 on the hydraulic cylinder. Place the disconnected end of the hose in a one-gallon can to collect the old fluid (approximately 3 pints).

(5) Using the TEST switch, held in the UP position, pump all of the fluid out of the cylinder unit. Reconnect the hose to port C3.

(6) Remove the filler cap and refill the reservoir with new fluid. Replace the cap.

(7) Remove the hose connection at port C2 and place the disconnected end of the hose in a one-gallon can.

(8) Using the TEST switch, held in the UP position, pump all remaining fluid out of the upper port of the cylinder. Replace the hose connection.

(9) Remove the filler cap and refill the reservoir with new fluid. Replace the cap.

(10) Purge the system of air by exercising the device several times with the TEST switch.

(11) Clean the air filter in the filling cap and blow dry. Lubricate the filter with a few drops of hydraulic oil.

(12) Replace the filler cap and check the system for leaks.

(13) Replace hydraulic unit housing cover reference paragraph 4-28(c).

Section IV. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

4-7. GENERAL. To ensure maximum operational readiness, inspect the THM/TG at periodic intervals, or as soon as possible after inclement weather so that defects can be discovered and corrected before they result in serious damage or assembly failure. Preventive maintenance includes inspecting, cleaning, and painting. Table 4-1 lists the periodic checks and services which are required for the THM/TG and associated equipment. Correct any deficiencies which are noted. If deficiencies require maintenance beyond the organizational level, notify DS/GS maintenance. Perform those actions in the "D" column daily, the "W" column weekly, the "M" column monthly, and the "A" column annually.

Table 4-1. Preventive Maintenance Checks and Services

D - Daily Time Required: 0.5 | W - Weekly Time Required: 0.1 | M - Monthly Time Required: 0.4 | A - Annually Time Required: 0.5

Interval and Sequence No. D	W	M	A	Item to be Inspected Procedure	Work Time (M/H)
				TARGET HOLDING MECHANISM/TANK GUNNERY	
1				Ensure that all THM/TG cable connections are securely tightened. Inspect lamp assembly for damage.	0.2
		1		Check reservoir fluid level. Ensure that the fluid level is within one-half inch of the reservoir's top.	0.3
			1	Change hydraulic fluid any time the fluid is found to be contaminated.	0.5
	1			Check for damage to hydraulic lines and fittings. Tighten loose fittings if leaks are detected.	0.1
2				Check THM/TG for smoothness of operation.	0.1
3				Using the RETS RCS or the OCD, operate the THM/TG in all modes to ensure serviceability.	0.1
				OPERATOR CONTROL DEVICE/TRANSMITTER	
4				Check battery contacts for corrosion. Clean as necessary.	0.1
	2			Check the operation of the Channel Select knob. The Channel Select knob should be lightly lubricated whenever the knob does not turn easily, or every 30 days when used frequently.	0.1

4-8. INSPECTION. A visual inspection of components, cables, and associated hardware should be conducted to ensure that all components of the THM/TG are in good condition. Dirt, grease, and foreign matter should be removed from electrical connectors. Areas in which paint is scratched, chipped, or worn should be spot painted. Replacement components should be installed for those found to be damaged or worn near or beyond serviceable limits. Specific repair functions authorized for various levels of maintenance are given in the maintenance allocation chart. Maintenance tasks not authorized for organizational maintenance personnel should be referred to the DS/GS maintenance unit.

4-9. CLEANING.

a. General Cleaning Instructions. The THM/TG should always be kept clean, otherwise, performance may be degraded and relatively obvious defects that would be noted in a visual inspection may be hidden by dust, dirt, or other foreign matter. See Appendix D, Expendable/Durable Supplies, for general cleaning materials applicable to the various components of the THM/TG.

WARNING

Denatured alcohol is flammable. Keep all flammable cleaning materials away from open flames. Failure to do so could result in injury or death.

(1) Metal parts. Use dry, clean wiping cloths to remove dust, dirt, grease, moisture, or other foreign matter from the THM/TG. If foreign matter cannot be removed using dry wiping cloths, dampen a cloth with alcohol or water and gently wipe the area.

CAUTION

Do not get denatured alcohol on the rubber parts or sealants. Denatured alcohol may cause rubber parts to deteriorate and may cause some sealants to dissolve.

(2) Nylon Webbing and Rubber Parts. Clean nylon webbing and rubber parts with a mild detergent and warm water solution. Rinse with clean water and dry with a clean, absorbent cloth.

(3) Plastic. Clean plastic parts with clean water and a mild detergent. Dry the parts with a clean, absorbent cloth.

4-10. PAINTING. Painting of the THM/TG at the organizational level is limited to touch-up and spot painting.

WARNING

Solvents used in paints are toxic and flammable. Keep paints from heat and open flames. Use only in a well-ventilated area. Avoid prolonged or repeated breathing of the vapor. Avoid prolonged or repeated contact with the skin.

CAUTION

Use masking tape to ensure that paint is not applied to the following: counterbores, bolt holes, lenses, plastic surfaces, or any attaching surfaces.

a. Clean and sand surface to be painted. Feather the sanding to an area one inch beyond the repair area.

b. Clean any sanding residue from the area to be painted.

c. Paint the surface using the same color and type of paint originally applied to equipment.

Section V. Troubleshooting

4-11. TROUBLESHOOTING. Troubleshooting the THM/TG at the organizational level is limited to verifying a malfunction, minor adjustments, and removal and replacement of assemblies. Malfunctions not correctable at the organizational level will be reported to DS/GS maintenance. See Table 4-2 for troubleshooting procedures.

Table 4-2. THM/TG Organizational Troubleshooting

WARNING

Disconnect the TKS from the THM/TG before performing test procedures. Failure to do so may result in serious injury or death.

MALFUNCTION	INSPECTION	CORRECTIVE ACTION
1. THM/TG TARGET ARM CANNOT BE RAISED OR LOWERED BY THE TEST SWITCH.	Step 1. Check all cables for serviceability. Ensure that all cables are securely tightened.	
	Step 2. Ensure that the FUNCTION switch is set to any position except 0.	

Table 4-2. THM/TG Organizational Troubleshooting - Continued

MALFUNCTION	INSPECTION	CORRECTIVE ACTION

Step 3. Place the TEST switch in UP or DOWN position.

The target arm should respond to the TEST switch and the BATTERY lamp should steadily illuminate.

If the target arm responds to the TEST switch the THM/TG is operational.

If the BATTERY lamp flashes when the TEST switch is in the UP or DOWN position, the battery needs charging.

If the target arm does not respond to the TEST switch and the BATTERY lamp is steadily illuminated (not flashing), proceed to Step 4.

Step 4. Remove power and check the fuse, F1, on the motor and valve assembly for continuity.

If the fuse is good, reinstall and proceed to Step 5.

If the fuse is open, replace and retest.

Step 5. Check the hydraulic fluid level. Ensure that the fluid is within 3/4 inch of the bottom edge of the filler spout.

If the hydraulic fluid is correct, proceed to Step 6.

If the hydraulic fluid is low, fill the reservoir and retest.

Step 6. Remove the Electronic Control Unit and replace it with a known good one. Retest.

If the THM/TG responds to the TEST switch, the THM/TG is operational.

If the THM/TG still does not respond to the TEST switch, install the original Electronic Control Unit and proceed to Step 7.

Step 7. Set the multimeter to measure 12 VDC. Connect the multimeter positive lead to the solenoid switch contact 3 (reference FO-15) and the negative lead to ground. Set the Electronic Control Unit TEST switch to the UP or DOWN position and the multimeter should indicate 11 VDC $\pm$ 1.5 VDC.

Table 4-2. THM/TG Organizational Troubleshooting - Continued

MALFUNCTION	INSPECTION	CORRECTIVE ACTION

If the multimeter indication is correct, proceed to Step 8.

If the multimeter indication is not correct; remove power, replace the solenoid switch, and retest.

Step 8. Visually inspect the motor valve assembly suppression circuit card for damage.

If no damage is noted, proceed to Step 9.

If the circuit card is damaged; remove power, replace the circuit card, and retest.

Step 9. Set a multimeter to measure 12 VDC. Connect the negative lead to ground and place the positive lead on the circuit card contacts as shown. Observe the multimeter indications.

THM/TG FUNCTION	SUPPRESSION CARD PIN NO.	MULTIMETER INDICATION
UP	1	Multimeter indicates 12 VDC ± 1.5 VDC, which drops to 0 VDC ± 1.5 VDC when the TEST switch is placed in the UP position.
DOWN	5	Multimeter indicates 12 VDC ± 1.5 VDC, which drops to 0 VDC ± 1.5 VDC when the TEST switch is placed in the DOWN position.
MOTOR	3	Multimeter indicates 12 VDC ± 1.5 VDC, which drops to 0 VDC ± 1.5 VDC when the TEST switch is placed in the UP or DOWN position.

If the multimeter indication is correct; remove power, replace the circuit card, and retest.

If the target arm still will not respond to the TEST switch; install the original circuit card, remove and replace the motor and valve assembly, and retest.

Table 4-2. THM/TG Organizational Troubleshooting - Continued

MALFUNCTION	INSPECTION	CORRECTIVE ACTION

If any of the multimeter indications are incorrect, remove power and check the continuity of wiring between the circuit card and connector P2 (reference FO-15). Repair as necessary.

If the continuity to connector P2 is good, check the continuity of the data cable between hydraulic box and Electronic Control Unit. Repair as necessary.

2. THM/TG TARGET WILL NOT RESPOND TO TARGET UP OR DOWN COMMANDS FROM THE RCS.

Step 1. Instruct the RCS operator to command other THM/TGs on the range.

If other THM/TGs respond to target commands, proceed to Step 2.

If no THM/TGs respond to target commands the problem is outside the THM/TG. Refer to TM 9-6920-742-24&P.

Step 2. Ensure that TIU circuit breaker CB1 is ON. Ensure cabling between TIU and THM/TG is properly connected.

If the circuit breaker CB1 is ON and the cabling is good, proceed to Step 3.

Step 3. Set the THM/TG TEST switch to the UP or DOWN position. The target arm should respond to the TEST switch.

If the target arm responds to the TEST switch, proceed to Step 4.

If the target arm does not respond to the TEST switch, proceed to Malfunction 1, Step 1.

Step 4. Remove power, replace the TIU (reference TM 9-6920-742-14&P-1) with a known good TIU, and retest.

If THM/TG responds to the RCS commands, THM/TG is operational.

If the THM/TG still does not respond to RCS commands, notify the next higher level of maintenance.

Table 4-2. THM/TG Organizational Troubleshooting - Continued

MALFUNCTION INSPECTION	CORRECTIVE ACTION
3. TARGET ARM REMAINS DOWN AND WILL NOT MOVE TO THE UP POSITION.	
Step 1. Set the FUNCTION switch to position 3 and the TEST switch to the UP position; observe the BATTERY lamp. The lamp should steadily illuminate (not flash).	If the BATTERY lamp flashes, the battery needs charging. If the BATTERY lamp is illuminated but the target arm stays in the DOWN position, proceed to Step 2.
Step 2. Remove all hit sensors and command the THM/TG target arm to the UP position using the TEST switch.	If the target arm now moves to the UP position, a hit sensor is defective. Proceed to Step 3. If the target arm does not respond to the test switch, proceed to Malfunction 1, Step 1.
Step 3. Set the FUNCTION switch to position 0. Connect a hit sensor and place the FUNCTION switch to 1.	If the target arm moves to the DOWN position, that hit sensor is defective. Evacuate hit sensor to next higher level maintenance.
Step 4. Repeat Step 3 for each hit sensor.	Replace defective hit sensor and retest.
4. THE RCS DOES NOT RECORD HITS FROM THE THM/TG.	
Step 1. Ensure that the FUNCTION switch is not in position 0.	
Step 2. Ensure that the hit sensors are securely mounted to the target board.	
Step 3. Simulate a hit by tapping on the hit sensors one at a time. The target arm should move to the DOWN position and a hit should be recorded at the RCS.	If the target arm does not move to the DOWN position, replace the hit sensor and retest.

Table 4-2. THM/TG Organizational Troubleshooting - Continued

MALFUNCTION INSPECTION	CORRECTIVE ACTION
	If the target arm moves to the DOWN position but a hit is not recorded at the RCS, proceed to Step 4.
Step 4.	Remove power and replace the Electronic Control Unit. Retest the hit sensors.
	If target arm moves to DOWN position and hits are recorded at the RCS, the THM/TG is operational.
	If hits are still not recorded at the RCS, proceed to Step 5.
Step 5.	Remove power and replace the TIU. Retest the hit sensors.
	If the hits are still not recorded on the RCS, notify the next higher level of maintenance.
5. THM/TG TARGET DRIVES INTO GROUND IN DOWN POSITION	
Step 1.	Exercise the THM/TG target arm with the TEST switch and adjust the DOWN limit switch. Retest.
	If the target arm no longer drives into the ground, the THM/TG is operational.
	If the target arm continues to drive into the ground, remove power; replace the Electronic Control Unit and retest.
	If the target arm still drives into the ground, remove power; replace limit switch cable P3, and retest.
6. THM/TG TARGET DRIVES INTO THM/TG COVER IN UP POSITION.	
Step 1.	Exercise the THM/TG target arm with the TEST switch and adjust the UP limit switch. Retest.
	If the target arm no longer drives into the cover, the THM/TG is operational.
	If the target arm continues to drive into the cover, remove power; replace the Electronic Control Unit, and retest.

Table 4-2. THM/TG Organizational Troubleshooting - Continued

MALFUNCTION INSPECTION	CORRECTIVE ACTION
	If the target arm still drives into the cover, remove power; replace limit switch cable P3, and retest.
7. LAMP ASSEMBLY IS INOPERATIVE	
Step 1. Check cable and connector for damage or looseness.	Tighten the cable and the connector if necessary. If cable and connector are secure and not damaged, proceed to Step 2. If the cable is damaged, repair and retest.
Step 2. Replace LA and retest.	If the LA flashes, end test. If the LA does not flash, proceed to Step 3.
Step 3. Remove fuse F1; check fuse for serviceability.	If fuse is defective, replace the fuse and retest the LA. If the LA flashes, end test. If the fuse is serviceable, proceed to Step 4.
Step 4. Remove and replace Electronic Control Unit and retest LA.	If the LA flashes, end test. If the LA does not flash, notify the next higher level of maintenance.
8. THM/TG WILL NOT RESPOND TO COMMANDS FROM THE RADIO TRANSMITTER.	
NOTE Before performing MALFUNCTION 8, ensure that THM/TG responds to TEST switch. If the THM/TG does not respond to the TEST switch, proceed to MALFUNCTION 1.	
Step 1. Set FUNCTION switch to position 4. Using the OCD, command the THM/TG to raise the target arm. The target arm should move to the UP position.	If the target arm does not move, check the OCD Channel Select and ensure that the frequency and channel match the receiver frequency and channel. Correct if necessary.

Table 4-2. THM/TG Organizational Troubleshooting - Continued

MALFUNCTION INSPECTION	CORRECTIVE ACTION
	If the frequency and channel are correct, check that the receiver antenna is properly mounted and that it is not screened off. The antenna may need to be extended (see figure 4-1). If the THM/TG still will not respond to the OCD, check that the OCD BATTERY lamp illuminates continuously while pressing a command pushbutton. If the BATTERY lamp flashes, replace the battery and retest. If the BATTERY lamp fails to illuminate, replace the lamp and retest. If the BATTERY lamp illuminates continuously, replace the OCD with a known good OCD and retest. If the THM/TG still will not respond to the OCD, replace the receiver and retest. If the THM/TG still will not respond to the OCD, notify the next higher level of maintenance.

Section VI. MAINTENANCE OF THE THM/TG

4-12. GENERAL. This section contains instructions for removal and installation of major components. If gaskets, seals, and/or decals are serviceable, do not repair or replace.

WARNING

Before removing or installing any component, remove power.

4-13. BATTERY BOX ASSEMBLY. (See figure 4-5.)

a. Removal of Battery Cables.

(1) Disconnect the negative power cable (3) from the black cable receptacle (4).

(2) Disconnect positive power cable (1) from the red cable receptacle (2).

b. Disassembly of Battery Box.

(1) Press the breather valve (5) to relieve internal pressure.

(2) Unlatch and remove the lid assembly (6).

(3) Remove the red electrical battery cable (7) from the positive battery terminal.

(4) Remove the black electrical battery cable (9) from the negative battery terminal.

(5) Remove the battery from the battery box (10).

(6) Remove nut (11), lockwasher (12), and red battery cable (7) from the red cable receptacle (2). Repeat procedure for removing the black battery cable (9) from the black cable receptacle (4).

(7) Remove the three screws (15), lockwashers (16), the battery receptacle washer (17), the red cable receptacle (2), and the pre-formed packing (18) from the battery box (10). Repeat this procedure for the black cable receptacle (4).

(8) Remove the nut (19) and the breather valve (5) from the battery box (10).

(9) Remove the side pads (20), back pad (21), and bottom pad (22) from the interior of the battery box (10). Clean area with denatured alcohol.

(10) Remove the cotter pin (23) and latch (24) from the battery box (10). Repeat this procedure for the remaining latches.

(11) Using a putty knife, remove the serial number sign (25) from battery box (10). Clean area with denatured alcohol.

(12) Remove the plug (26) and packing (27) from the lid assembly (6).

(13) Remove the gasket (28) and the two strips (29) from the lid assembly (6). Clean area with denatured alcohol.

(14) Using a putty knife, remove the battery box warning sign (30) from the lid assembly (6). Ensure that the sign is completely removed. Clean area with denatured alcohol.

c. Assembly of Battery Box.

(1) Place the battery box warning sign (30) on the lid assembly (6).

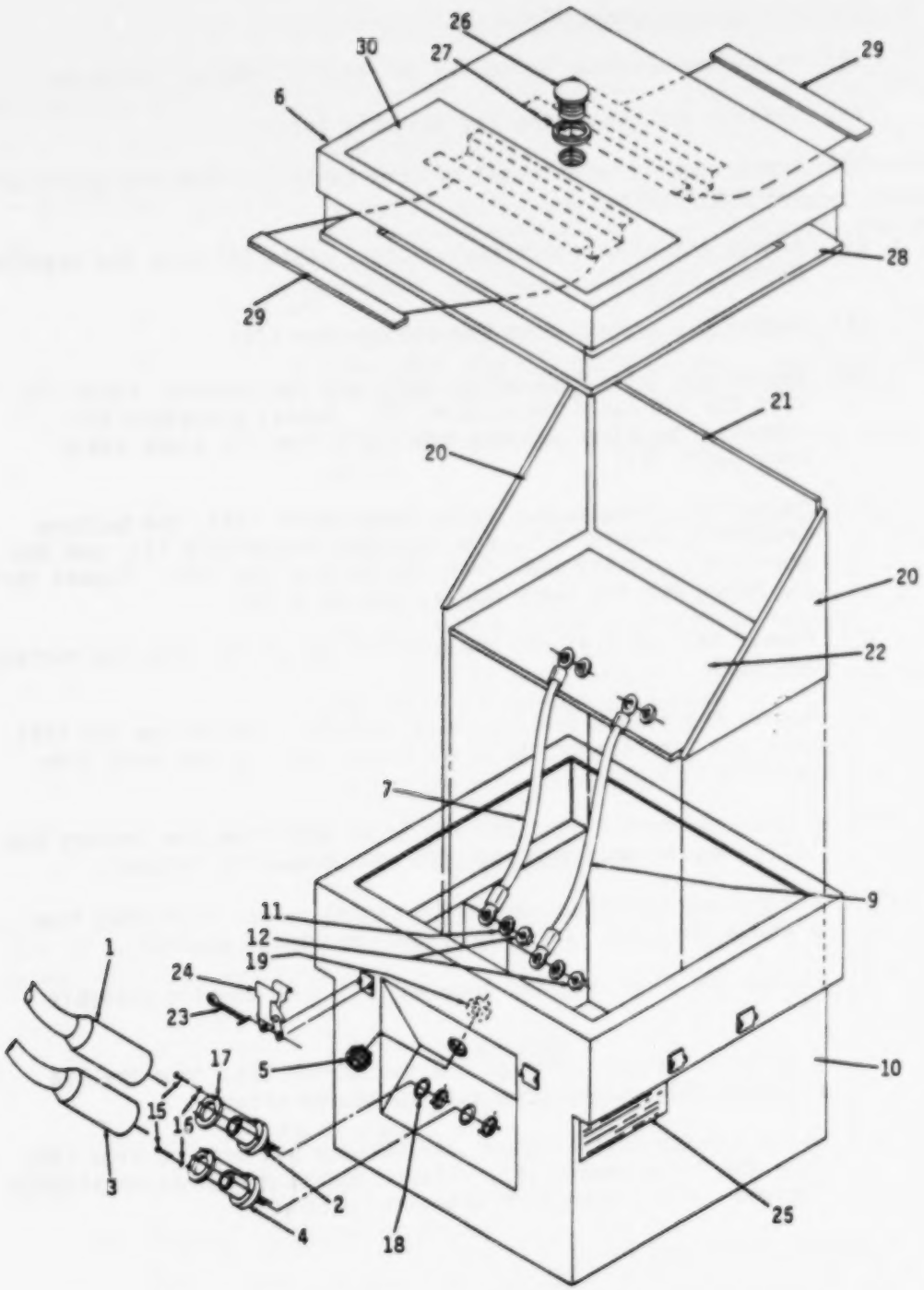


Figure 4-5. Battery Box Assembly

c. (1) Place the battery box warning sign (30) on the lid assembly (6).

(2) Connect the gasket (28) and the two strips (29) to the lid assembly (6) with rubber cement.

(3) Secure the plug (26) and packing (27) to the lid assembly (6).

(4) Using rubber cement, secure the serial number sign (25) to the battery box (10).

(5) Connect the latch (24) to the battery box (10) with a cotter pin (23). Repeat this procedure for the remaining latches.

(6) Using rubber cement, connect the side pads (20), back pad (21), and bottom pad (22) to the interior of the battery box (10).

(7) Connect the breather valve (5) to the battery box (10) with a nut (19).

(8) Connect the red cable receptacle (2) to the battery box (10) with three screws (15), lockwashers (16), the battery receptacle washer (17), and the pre-formed packing (18). Repeat this procedure for the black cable receptacle (4).

(9) Connect the red battery cable (7) to the red cable receptacle (2) with a nut (11) and lockwasher (12). Repeat this procedure for connecting the black battery cable (9) to the black receptacle (4).

(10) Place the battery in the battery box (10) with the positive terminal adjacent to the red cable receptacle (2).

(11) Connect the black electrical battery cable (9) to the negative battery terminal.

(12) Connect the red electrical battery cable (7) to the positive battery terminal.

(13) Latch the lid assembly (6) to the battery box (10).

d. Installation of Battery Cables.

(1) Connect the positive power cable (1) to the red cable receptacle (2).

(2) Connect the negative power cable (3) to the black cable receptacle (4).

4-14. LAMP ASSEMBLY (LA). (See figure 4-6.)

a. Removal.

(1) Disconnect the LA cable connector (1) from the THM/TG Electronic Control Unit (2).

(2) Loosen the clamp screw (3) and remove the LA (4) from its mounting position.

b. Disassembly.

(1) Remove screws (5) and separate the front housing (6) from the rear housing (7).

(2) Remove the two screws (8) and cable assembly spades (9) from the rear of the lamp (10).

(3) Remove the four spring clamps (11) and the lamp (10) from the front housing (6).

(4) Remove cable assembly (12) from rear housing (7).

(5) Remove the nut (13), carriage bolt (14), sleeve spacer (15), and pivot bracket (16) from the lamp mounting bracket (17).

(6) Remove machine screw (18), lockwasher (19), flat washer (20) grommet (21), and rear housing (7) from the pivot bracket (16).

(7) Remove the two nuts (22) and clamp screw (3) from the lamp mounting bracket (17).

c. Assembly.

(1) Attach the clamp screw (3) and two nuts (22) to the lamp mounting bracket (17).

(2) Attach the rear housing (7) to the pivot bracket (16) with flat washer (20), lockwasher (19), and machine screw (18).

(3) Attach the pivot bracket (16) to the lamp mounting bracket (17) with a sleeve spacer (15), carriage bolt (14), and nut (13).

(4) Insert the cable assembly (12) into the rear housing (7) through grommet (21).

(5) Remove the nut (13), carriage bolt (14), sleeve spacer (15), and pivot bracket (16) from the lamp mounting bracket (17).

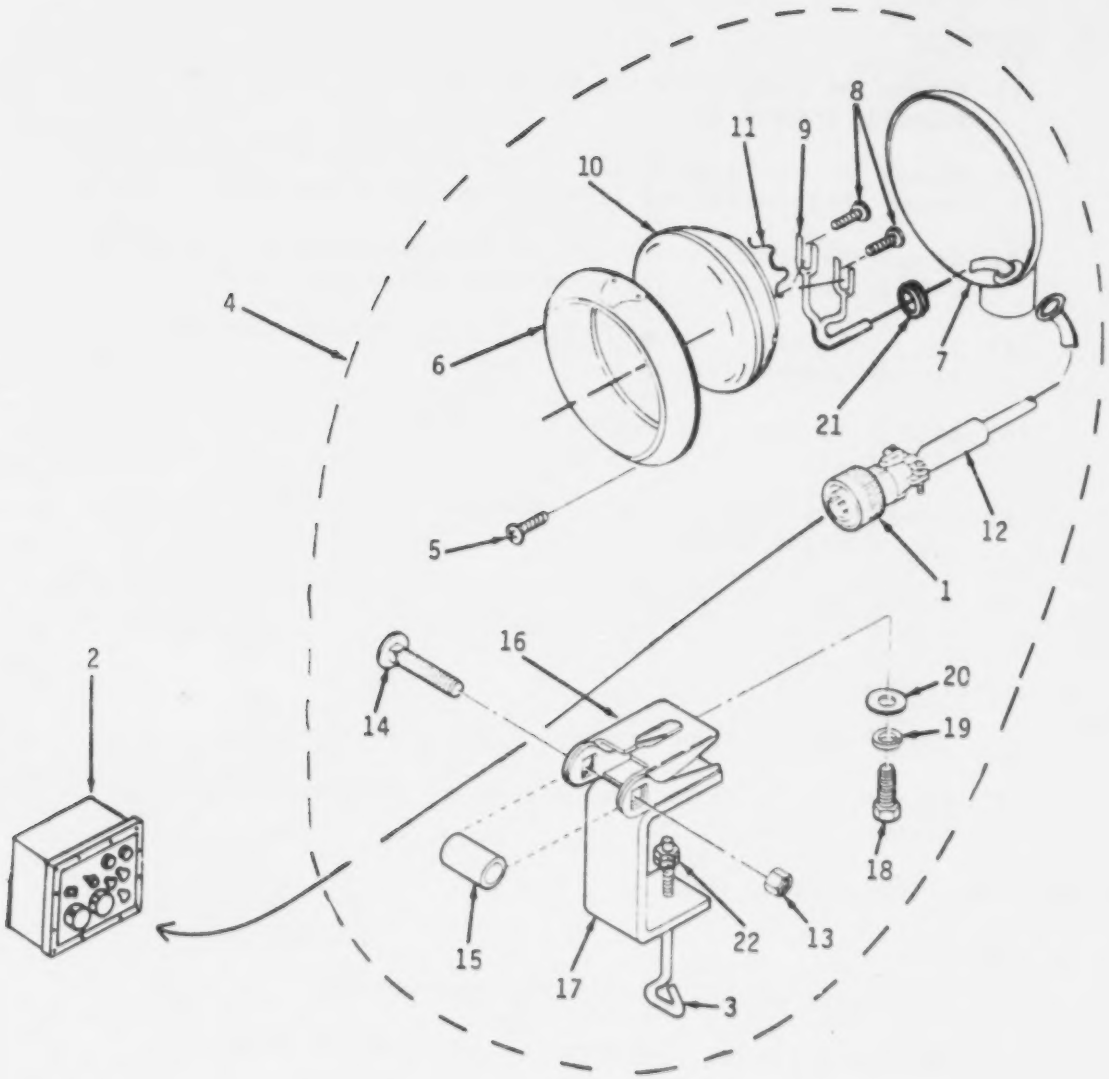


Figure 4-6. Lamp Assembly

(6) Remove machine screw (18), lockwasher (19), flat washer (20) grommet (21), and rear housing (7) from the pivot bracket (16).

(7) Remove the two nuts (22) and clamp screw (3) from the lamp mounting bracket (17).

c. Assembly.

(1) Attach the clamp screw (3) and two nuts (22) to the lamp mounting bracket (17).

(2) Attach the rear housing (7) to the pivot bracket (16) with flat washer (20), lockwasher (19), and machine screw (18).

(3) Attach the pivot bracket (16) to the lamp mounting bracket (17) with a sleeve spacer (15), carriage bolt (14), and nut (13).

(4) Insert the cable assembly (12) into the rear housing (7) through grommet (21).

(5) Attach the lamp (10) to the front housing (6) with four spring clips (11).

(6) Connect the cable assembly spades (9) to the rear of the lamp (10) with two screws (8).

(7) Attach the rear housing (7) to the front housing (6) and secure with a screw (5).

d. Installation.

(1) Attach the LA (4) by tightening the clamp screw (3).

(2) Connect the LA cable connector (1) to the THM/TG electronic control unit (2).

4-15 RECEIVER. (See figure 4-7.)

a. Removal.

(1) Remove the antenna (1) from the receiver (2).

(2) Unlatch the cover fasteners (3) and raise the cover (4).

(3) Disconnect receiver cable P1 (5) from the J1 connector on the receiver (2).

(4) Loosen the receiver retainer screw (6) and carefully remove the receiver (2) from THM/TG (7).

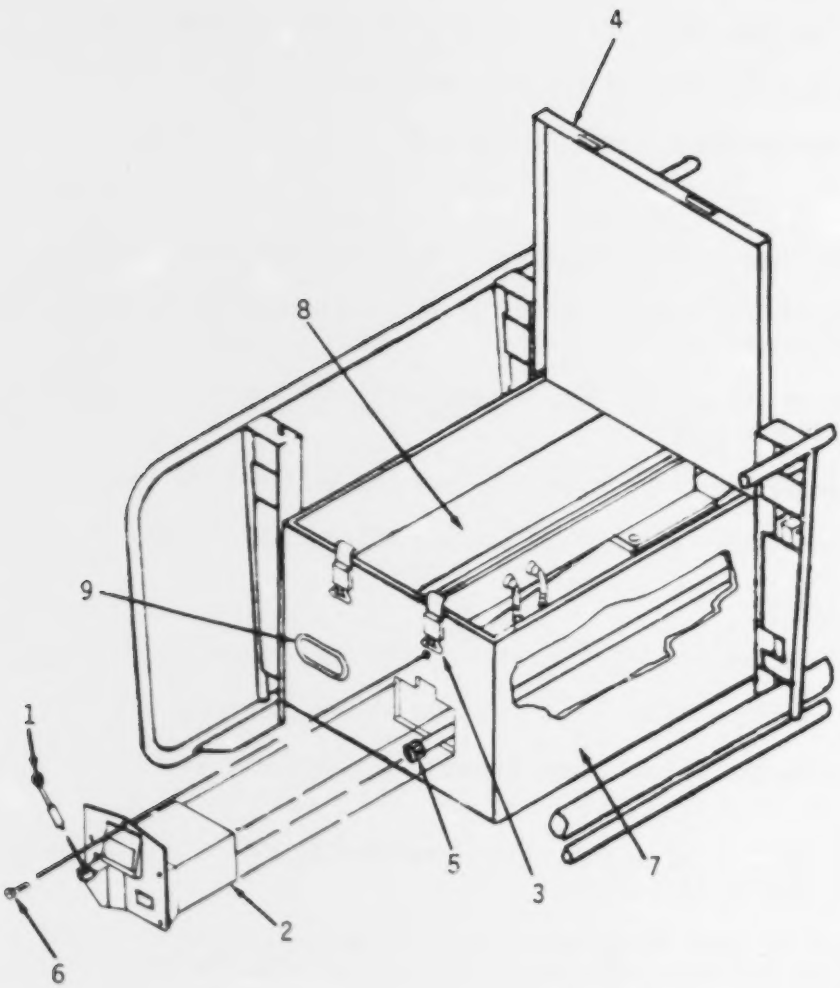


Figure 4-7. Receiver

b. Installation.

(1) Carefully slide the receiver (2) into THM/TG (7) and tighten the receiver retainer screw (6).

(2) Connect receiver cable P1 (5) to the J1 connector on the receiver (2).

(3) Close the cover (4) and secure the cover fasteners (3).

(4) Insert the antenna (1) into the receiver (2).

4-16. TARGET HOLDER ASSEMBLY. (See figure 4-8.)

a. Removal.

(1) Pull the shaft extension (1) from the shaft seal (2).

(2) Remove the machine screw (3) and lockwasher (4) from the shaft extension (1).

(3) Slide the holder clamp assembly (5) off the end of the shaft extension (1).

(4) Remove the clamp screw (6) from the holder clamp (7).

(5) Remove the retainer (8) and pad (9) from the holder clamp (7).

b. Installation.

(1) Place the pad (9) and retainer (8) inside the holder clamp (7).

(2) Insert the clamp screw (6) into the holder clamp (7).

(3) Slide the holder clamp assembly (5) onto the shaft extension (1).

(4) Install a lockwasher (4) and machine screw (3) on the shaft extension (1).

(5) Ensure that the groove (10) is aligned with the alignment-pin (11) and push the shaft extension (1) into the shaft seal (2).

4-17. COVER ASSEMBLY. (See figure 4-9.)

a. Removal.

(1) Release the two catches (1) from the cover (2).

(2) Remove the four machine screws (3) and lockwashers (4). Lift the cover (2) from the housing (5).

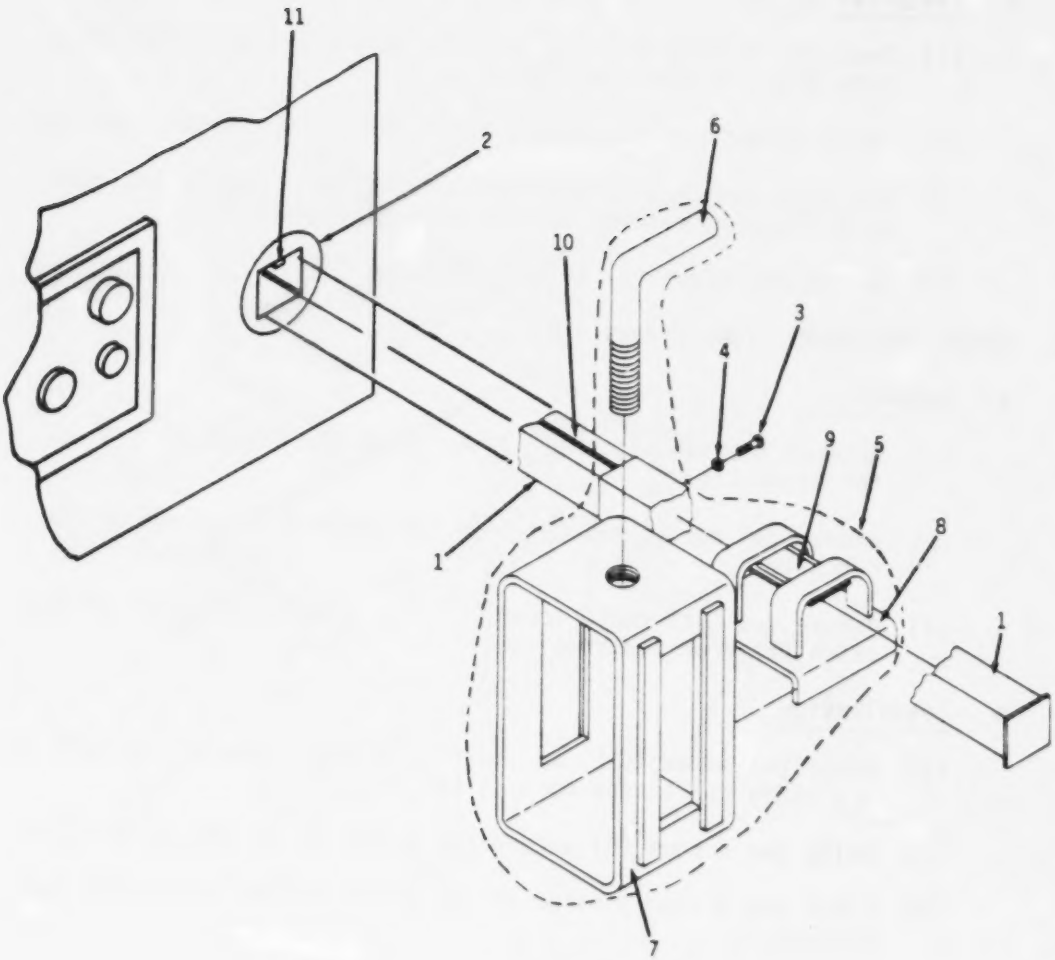


Figure 4-8. Target Holder Assembly

(3) Using a putty knife, remove the gasket (6) from the cover (2) and clean residue with denatured alcohol.

(4) Using a putty knife, remove the decals (7) from the cover (2) and clean the area with denatured alcohol.

b. Installation.

(1) Peel the backing from replacement decals (7) and press them into place on the cover (2).

(2) Using rubber cement, attach a new gasket (6) to the cover (2).

(3) Position the cover (2) on the housing (5). Secure the cover with four lockwashers (4) and machine screws (3).

(4) Secure the cover (2) with two catches (1).

4-18. CATCH, PULLDOWN. (See figure 4-9.)

a. Removal.

(1) Release the two catches (1) and raise the hinged portion of the cover (2).

(2) Remove the two screws (8) from the cover (2) and remove the catch (9).

(3) Remove two nuts (10), screws (11) and the bottom half of the catch (1) from the housing (5).

b. Installation.

(1) Using two screws (11) and nuts (10) secure the bottom half of the catch (1) to the housing (5).

(2) Using two screws (8) secure the catch (9) to the cover (2).

(3) Lower the hinged portion of the cover (2) and secure the two catches (1).

4-19. ELECTRONIC CONTROL UNIT. (See figure 4-9.)

NOTE

Disconnect battery cables.

a. Removal.

(1) Disconnect all cables attached to the front of the Electronic Control Unit (12).

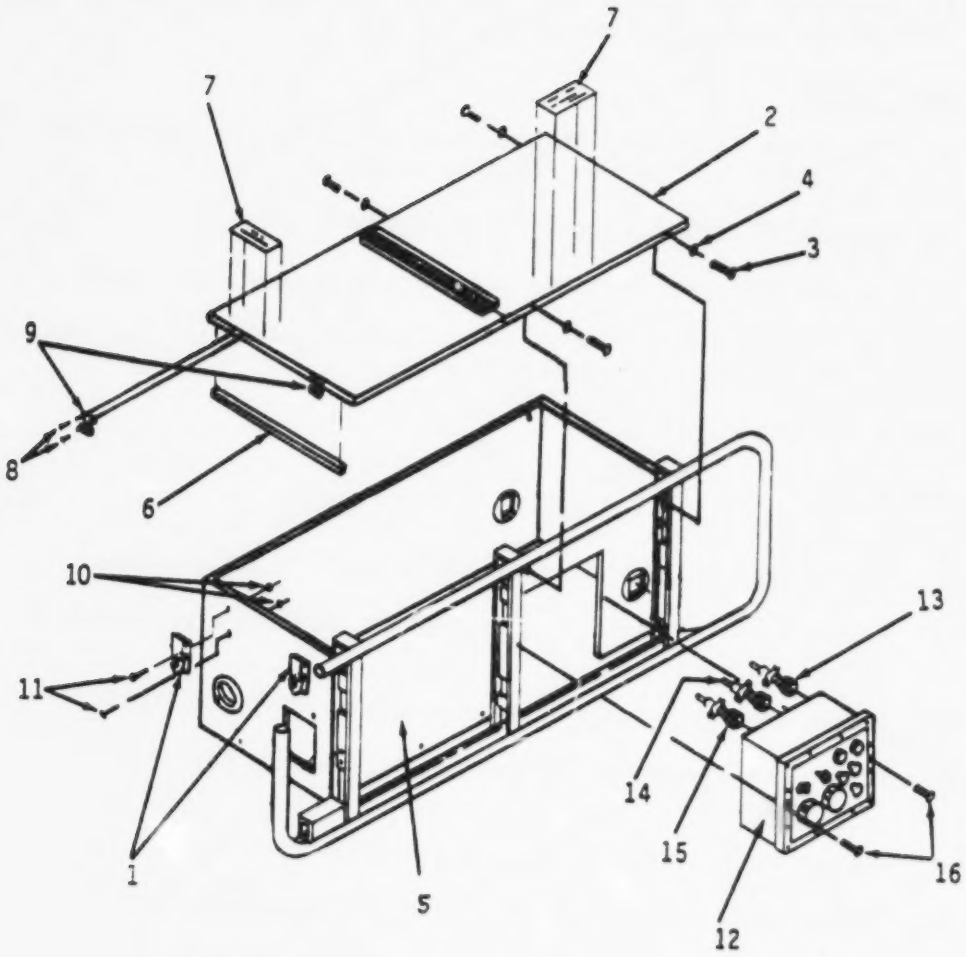


Figure 4-9. Cover Assembly

(2) Remove the cover assembly (reference paragraph 4-17a).

(3) Disconnect all cables attached to the rear of the Electronic Control Unit.

(4) Loosen the two retaining screws (16) and remove the Electronic Control Unit (12) from the housing (5).

b. Installation.

(1) Insert the Electronic Control Unit (12) into the housing (5) and secure it with two retaining screws (16).

(2) Connect all cables removed in paragraph 4-19(a)(3).

(3) Replace the cover assembly (2) (reference paragraph 4-17b).

(4) Connect all cables removed in paragraph 4-19a(1) to the front of the Electronic Control Unit (12).

4-20. SIDE COVER. (See figure 4-10.)

a. Removal.

NOTE

The battery and all external cables must be disconnected.

(1) Remove both target holding assemblies (reference paragraph 4-16a).

(2) Remove the cover (reference paragraph 4-17a(1) and (2)).

(3) Remove the Electronic Control Unit (reference paragraph 4-19a).

(4) Remove the receiver (reference paragraph 4-15a).

(5) Remove the stabilizer bar (1) from the protective frame (2).

(6) Remove the four bolts (3) and lockwashers (4) from the upper ends of the protective frame (2) and lift out the two crossbars (5).

(7) Remove the two bolts (6) and lockwashers (7) from the upper middle of the protective frame (2).

(8) Remove the protective frame (reference paragraph 4-26(a)).

(9) Remove the fifteen machine screws (11), lockwashers (12), and flatwashers (13) from around the bottom edge of the side cover (14).

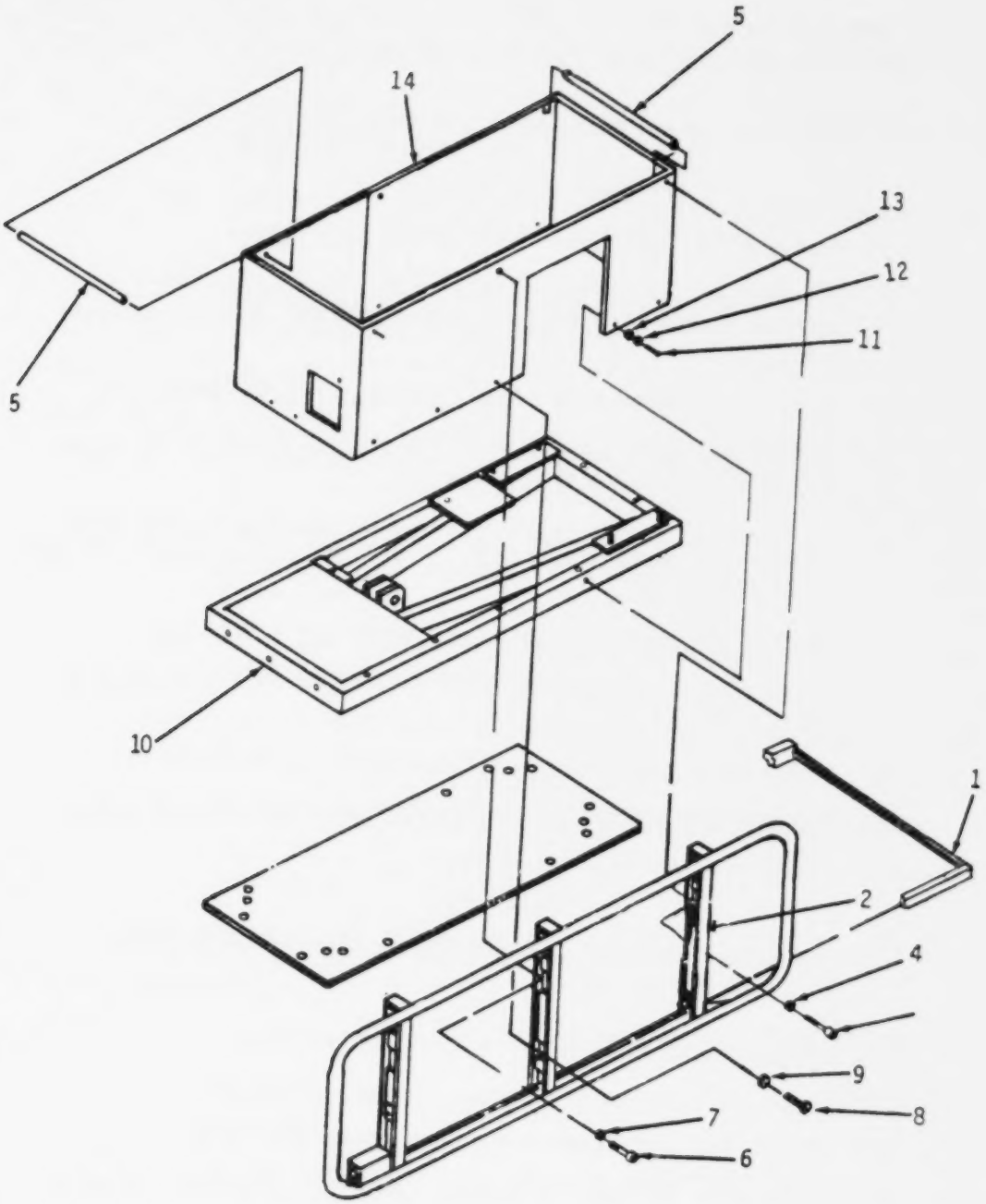


Figure 4-10. Side Cover

NOTE

Personnel required: 2

(10) Lift the side cover (14) from the base (10).

b. Installation.

NOTE

Personnel required: 2

(1) Position the side cover (14) on the base (10).

(2) Install the fifteen flatwashers (13), lockwashers (12), and machine screws (11) around the bottom edge of the side cover (14).

(3) Install the protective frame (reference paragraph 4-26b).

(4) Install the two lockwashers (7) and bolts (6) into the upper middle of the protective frame (2).

(5) Position the two crossbars (5) and secure them to the upper ends of the protective frame (2) with four lockwashers (4) and bolts (3).

(6) Install the receiver (reference paragraph 4-15b).

(7) Install the Electronic Control Unit (reference paragraph 4-19b).

(8) Install the cover (reference paragraph 4-17b(3) and (4)).

(9) Install both target holding assemblies (reference paragraph 4-16b(5)).

NOTE

The battery and all external cables must be reconnected prior to operation.

4-21. HYDRAULIC UNIT. (See figure 4-11.)

a. Removal.

(1) Remove the side cover (reference paragraph 4-20a).

(2) Disconnect the special purpose cable (1) from the hydraulic unit (2).

NOTE

Hydraulic fluid will leak when the hydraulic lines are disconnected. Tag all hydraulic lines prior to removal.

(3) Using two wrenches, disconnect the two hydraulic lines (3) from the hydraulic unit (2).

(4) Remove two bolts (4), lockwashers (5) and flat washers (6) from the front end of the hydraulic unit (2).

(5) Remove the bolt (7) and lockwasher (8) from the rear end of the hydraulic unit (2), and lift the hydraulic unit (2) from the protective frame base (9).

b. Installation.

(1) Position the hydraulic unit (2) on the protective frame base (9) and secure with a lockwasher (8) and bolt (7) to the rear end of the hydraulic unit (2).

(2) Secure the front end of hydraulic unit (2) with two flat washers (6), lockwashers (5), and bolts (4) to the protective frame base (9).

(3) Using two wrenches, connect the two tagged hydraulic lines (3) to the hydraulic unit (2).

(4) Connect the special purpose cable (1) to the hydraulic unit (2).

(5) Replace the side cover (reference paragraph 4-20b).

(6) Check for proper hydraulic fluid level in the motor valve reservoir.

4-22. CHANNEL RUBBER. (See figure 4-7.)

a. Removal.

(1) Disconnect the battery cables from the hydraulic unit (8).

(2) Remove the rubber channel (9) from the side cover (7) with a putty knife.

(3) Scrape old cement from the side cover (7) and clean residue with denatured alcohol.

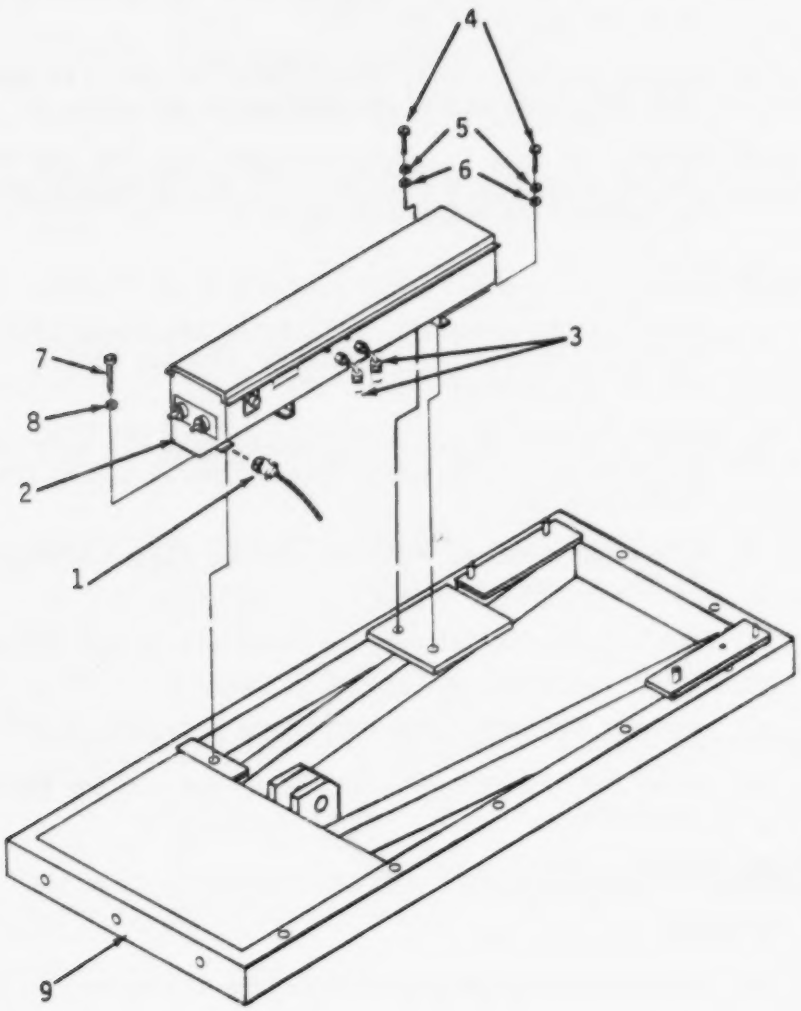


Figure 4-11. Hydraulic Unit

b. Installation.

(1) Apply rubber cement to the edge of the cut-out on the side cover (7).

(2) Position the rubber channel (9) into the cut-out on the side cover (7) and press into place. Allow cement to dry.

(3) Connect the battery cables to the hydraulic unit.

4-23. HYDRAULIC CYLINDER. (See figure 4-12).

a. Removal.

(1) Ensure target arm is in the DOWN position

(2) Disconnect the battery cables.

(3) Remove the cover assembly (reference paragraph 4-17a.)

(4) Remove Electronic Control Unit (reference paragraph 4-19a).

NOTE

Tag all hydraulic lines prior to removal.

(5) Using two wrenches remove the two hydraulic lines (1) from the hydraulic cylinder (2).

(6) Remove two cotter pins (3). Remove the front and rear journals (4), being careful not to lose the four axial pressure washers (5). Remove the hydraulic cylinder (2) from the base frame (6).

(7) Remove the two fittings and retain for reuse. Send hydraulic cylinder to next higher level maintenance.

b. Installation.

(1) Insert two hydraulic fittings into replacement cylinder.

(2) Position the hydraulic cylinder (2) on the base frame (6) and insert four axial pressure washers (5). Insert the front and rear journals (4) and secure each with two cotter pins (3).

(3) Using two wrenches, connect the two tagged hydraulic lines (1) to the hydraulic cylinder (2).

(4) Install Electronic Control Unit (reference paragraph 4-19b).

(5) Install the cover assembly (reference paragraph 4-17b.)

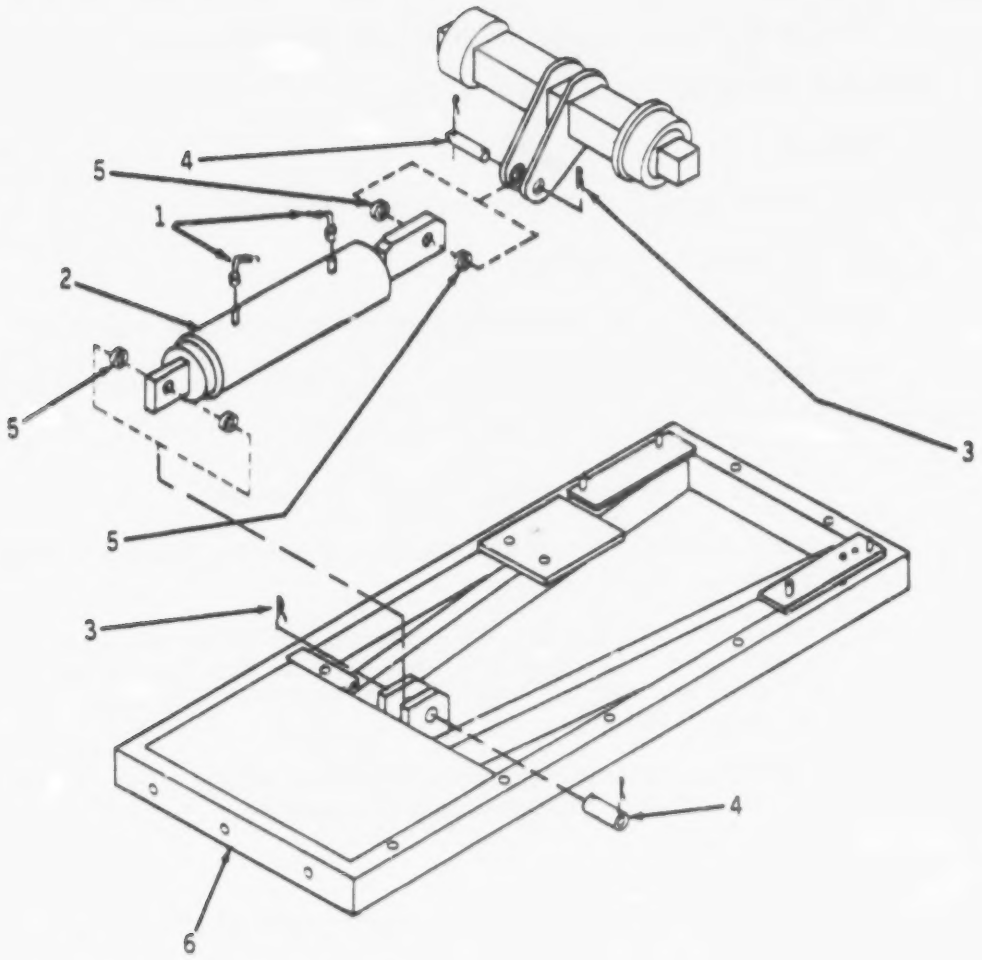


Figure 4-12. Hydraulic Cylinder

(6) Connect the battery cables.

(7) Exercise the target arm.

(8) Check the hydraulic fluid level.

4-24. LIMIT SWITCH CABLE ASSEMBLY P3. (See figure 4-13.)

a. Removal.

(1) Remove THM/TG cover (reference paragraph 4-17a).

(2) Remove Electronic Control Unit (reference paragraph 4-19a).

(3) Loosen the screw (1) holding the actuator switch (2), and move the actuator switch (2) to gain access to the mounting plate screws (3).

(4) Remove the two mounting plate screws (3), lockwasher (4), the mounting plate (5), and spacer (6) from pillow block assembly (7).

(5) Remove wire wrap (8) from mounting plate (5) and wire wrap securing P3 cable to crossbar.

(6) Remove two screws (9), lockwasher (10), flat washer (11), and actuator switch (12) from pillow block assembly (7).

(7) Remove screw (13), lockwasher (14), washer (15), and clamp (16) from pillow block assembly (7).

(8) Remove two screws (17), lockwasher (18), S3 mounting plate (19), and spacers (6) from pillow block assembly (7).

(9) Remove two screws (20) and lockwashers (21) that secure switch S1 (22) to the mounting plate (5). Remove S1 (22).

NOTE

Magnetic switch S2 (23) is removed in the same manner as S1.

(10) Remove the two screws (20) and lockwasher (21) that secure the magnetic switch S3 (24) to the mounting plate (19). Remove switch S3 (24).

b. Installation.

(1) Position switch S3 (24) on mounting plate (19) and secure it with two lockwashers (21) and screws (20).

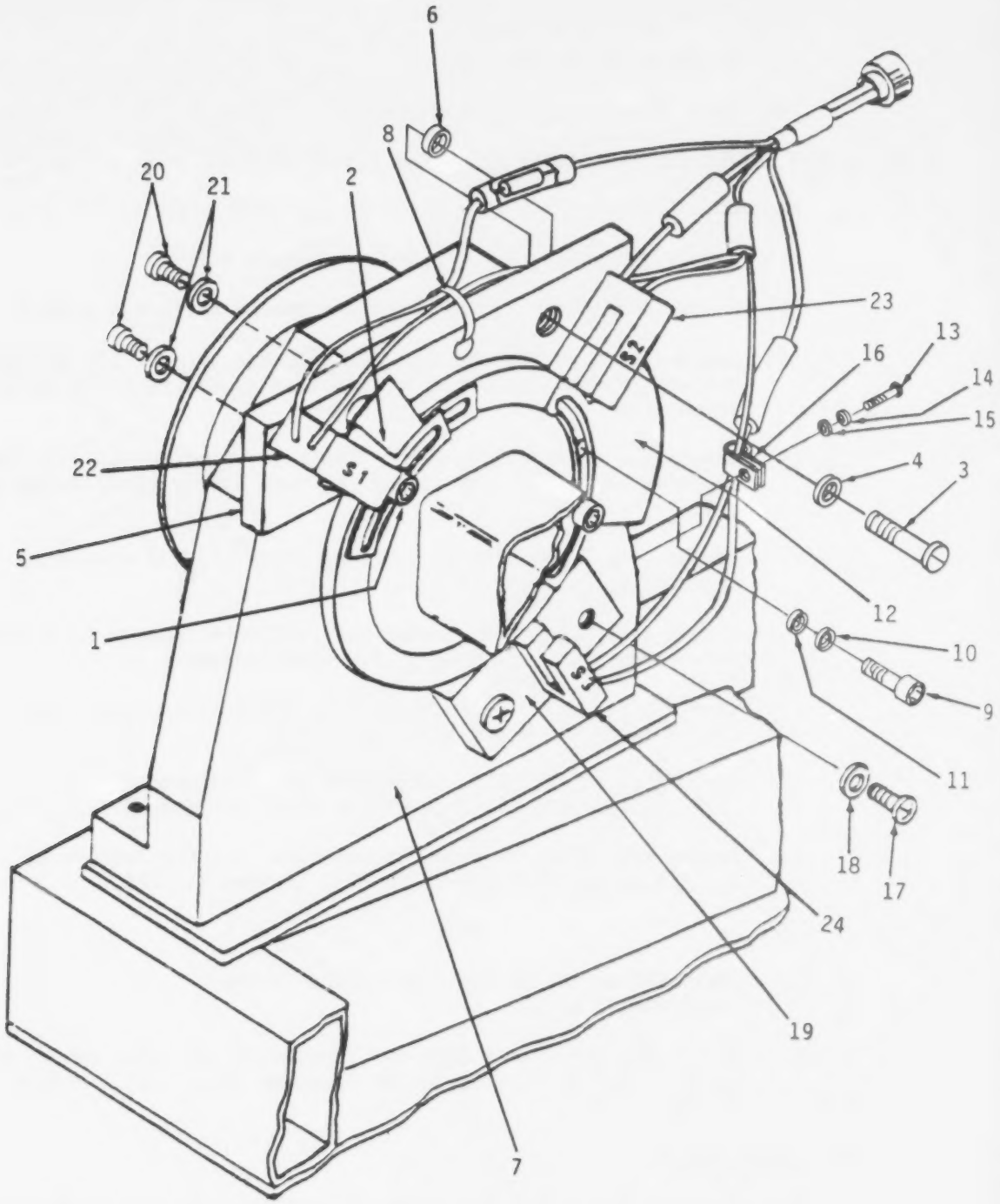


Figure 4-13. Limit Switch Assembly

(2) Position switch S1 (22) and S2 (23) on mounting plate (5) and secure with two lockwashers (21) and screws (20), (see FO-11, sheet 2).

(3) Position mounting plate (19) with spacer (6) on the pillow block assembly (7), and secure with two lockwashers (18) and screws (17).

(4) Secure S3 wiring to pillow block assembly (7) with clamp (16), washer (15), lockwasher (14), and screw (13).

(5) Position actuator switch (12) on pillow block assembly (7) and secure with washer (11), lockwasher (10), and screw (9).

(6) Position the mounting plate (5), with spacers (6), on pillow block assembly (7) and secure with lockwashers (4) and screws (3).

(7) Secure S1 and S2 wiring to mounting plate (5) with wire wrap (8) and secure P3 cable assembly to crossbar with wire wrap.

(8) Install the Electronic Control Unit (reference paragraph 4-19b).

(9) Adjust Magnetic Switches S1, S2 and S3 (reference paragraph 4-25).

(10) Install THM/TG cover assembly (reference paragraph 4-17b).

4-25. ADJUSTMENT OF LIMIT SWITCHES. (See figure 4-13.)

NOTE

Adjustment of the Limit Switches must be done with a target mounted in the target holders. Ensure that the limit switches are securely fastened to their mounting plates and that all electrical connections are secure.

a. Limit Switch S1

(1) Place the FUNCTION switch (located on the Electronic Control Unit) in position 1 and lower the target with the TEST switch. Once the target is in the lowered position, turn the FUNCTION switch to 0 (OFF).

(2) If the target has not reached the horizontal position before it stops, the leading edge of cog 1 (2) is entering the switch (22) too soon. Loosen the socket-head screw (1) and adjust cog 1 (2) 1/3 of an inch in a clockwise direction. Tighten the socket-head screw (1).

(3) Test THM/TG and readjust cog 1 (2) 1/8 of an inch at a time as necessary.

(4) If the target goes beyond the horizontal position before it stops, the leading edge of cog 1 (2) is entering the switch (22) too late. Loosen the socket-head screw (1) and adjust cog 1 (2) 1/8 of an inch in a counterclockwise direction. Tighten the socket-head screw (1).

(5) Test THM/TG and readjust cog 1 (2) 1/8 of an inch at a time as necessary.

b. Limit Switch S2

(1) Place the function switch in position 1 and raise the target with the TEST switch. Once the target is in the raised position, turn the function switch to 0 (OFF).

NOTE

When adjusting cog 2, do not disturb cog 1.

(2) If the target has not reached 90 degrees in the raised position, the leading edge of cog 2 (2) is entering the switch (23) too early. Cog 2 must be adjusted counter clockwise using the same procedures used for cog 1.

c. Limit Switch S3

(1) Place the function switch in position 1 and lower the target with the test switch.

(2) Place the function switch in position 1 and raise the target with the test switch. Observe cog 3 (12) as the target is rising. The leading edge of cog 3 (12) should enter S3 (24) at approximately the 30 degree position from the DOWN position of the target.

(3) If the leading edge of cog 3 (12) does not enter S3 (24) at 30 degrees, loosen the two socket-screws (9) and adjust cog 3 (24) for the required 30-degree entry into S3 (24).

4-26. PROTECTIVE FRAME. (See figure 4-14.)

a. Removal.

(1) Remove the target holders (reference paragraph 4-16a).

(2) Remove the cover (reference paragraph 4-17a).

(3) Remove the side cover (reference paragraph 4-20a).

(4) Remove the stabilizer bar (1) and use it to elevate the THM/TG when removing the protective frame (4).

(5) Remove the three bolts (2) and lockwashers (3) and lift off the protective frame (4) from the baseframe (5).

(6) Remove the other side of the protective frame in same manner.

b. Installation.

(1) Align the protective frame (4) with the base frame (5) and secure it with three lockwashers (3) and bolts (2).

(2) Install the stabilizer (1).

(3) Install the side cover (reference paragraph 4-20b).

(4) Install the cover (reference paragraph 4-17b).

(5) Install the target holders (reference paragraph 4-16b).

(6) Install the other side of the protective frame in the same manner.

4-27. STOP, RUBBER. (See figure 4-14.)

a. Removal.

Remove the two machine screws (6) and lock washers (7) from the plate nut (8). Lift the plate nut (8) and the rubber stop (9) from the protective frame (4).

b. Installation.

Position the plate nut (8) and rubber stop (9) on the protective frame (4) and secure them with two lockwashers (7) and machine screws (6).

4-28. COVER, HOUSING, HYDRAULIC UNIT. (See figure 4-15.)

a. Removal.

(1) Remove the cover assembly (reference 4-17a).

(2) Remove the plug (1) and retain.

(3) Remove the fourteen machine screws (2), lockwashers (3), and flat washers (4) and lift the cover (5) from the housing (6).

b. Repair.

(1) Using a putty knife, remove the old gasket (7).

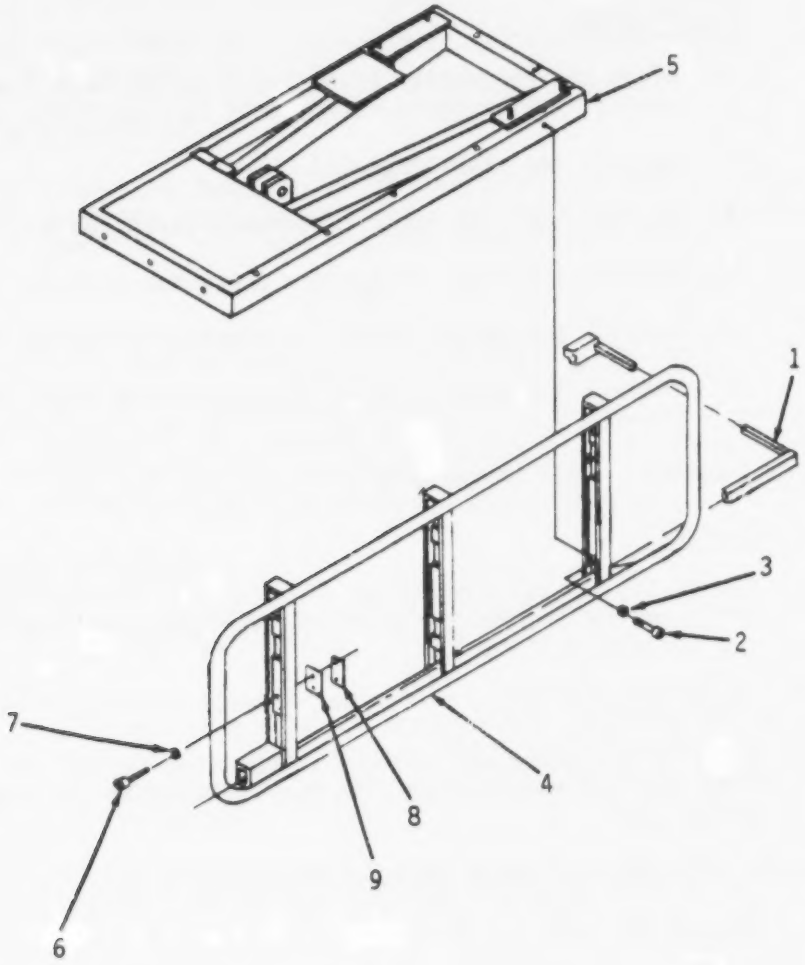


Figure 4-14. Protective Frame

(2) Use denatured alcohol to clean the channel of all residue.

(3) Spread a thin layer of cement on the cover channel and align a gasket (7) into the channel.

(4) Press a gasket (7) into the channel and allow the cement to dry.

c. Installation.

(1) Position the cover (5) onto the housing (6) and secure it with fourteen machine screws (2), lockwashers (3), and flat washers (4).

(2) Install the plug (1) into the cover (5).

(3) Replace the cover assembly (reference paragraph 4-17b).

4-29. MOTOR/VALVE ASSEMBLY. (See figure 4-15.)

NOTE

Remove power from unit.

a. Removal.

(1) Remove the cover assembly (reference 4-17a).

(2) Remove the electronic control unit (reference 4-19a).

(3) Remove the hydraulic unit cover (reference 4-28a).

(4) Remove the solenoid switch (reference paragraph 4-35a).

(5) Remove cable ties (14).

(6) Remove the machine screw (21), lockwasher (22) and flat washer (23) from the bus bar (24).

(7) Remove the hydraulic hoses (25 and 26).

(8) Remove the two machine screws (28), and lockwashers (29), and flat washers (30) that secure the motor pump (31) to the box (6).

(9) Remove two machine screws (32), and lockwashers (33), and flat washer (34) that secure other end of motor pump (31) to the box (6).

(10) Tag and remove ground leads and screw (13) from motor pump.

(11) Lift the motor valve (31) from the box (6).

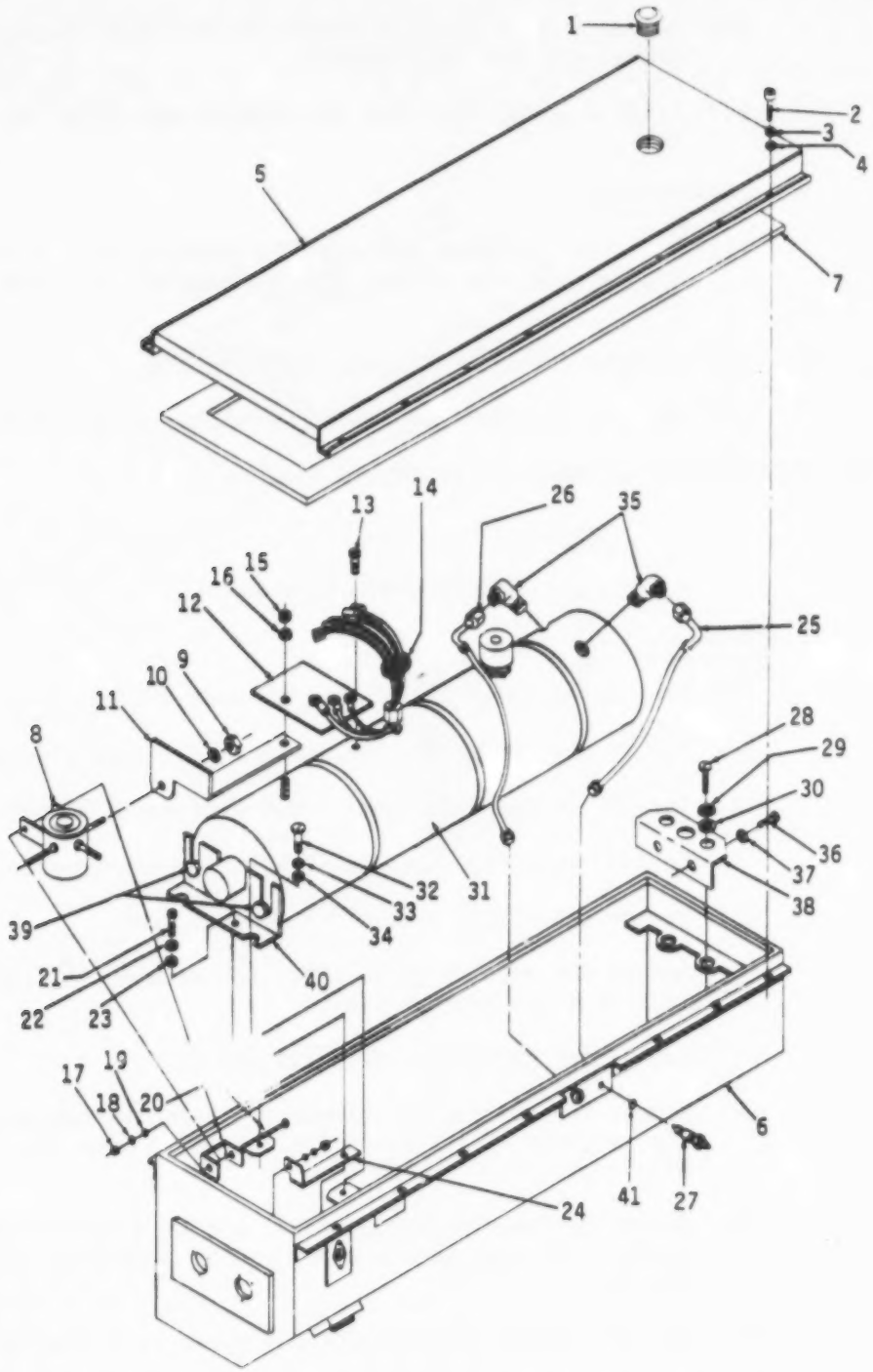


Figure 4-15. Housing, Hydraulic Unit (Sheet 1 of 2)

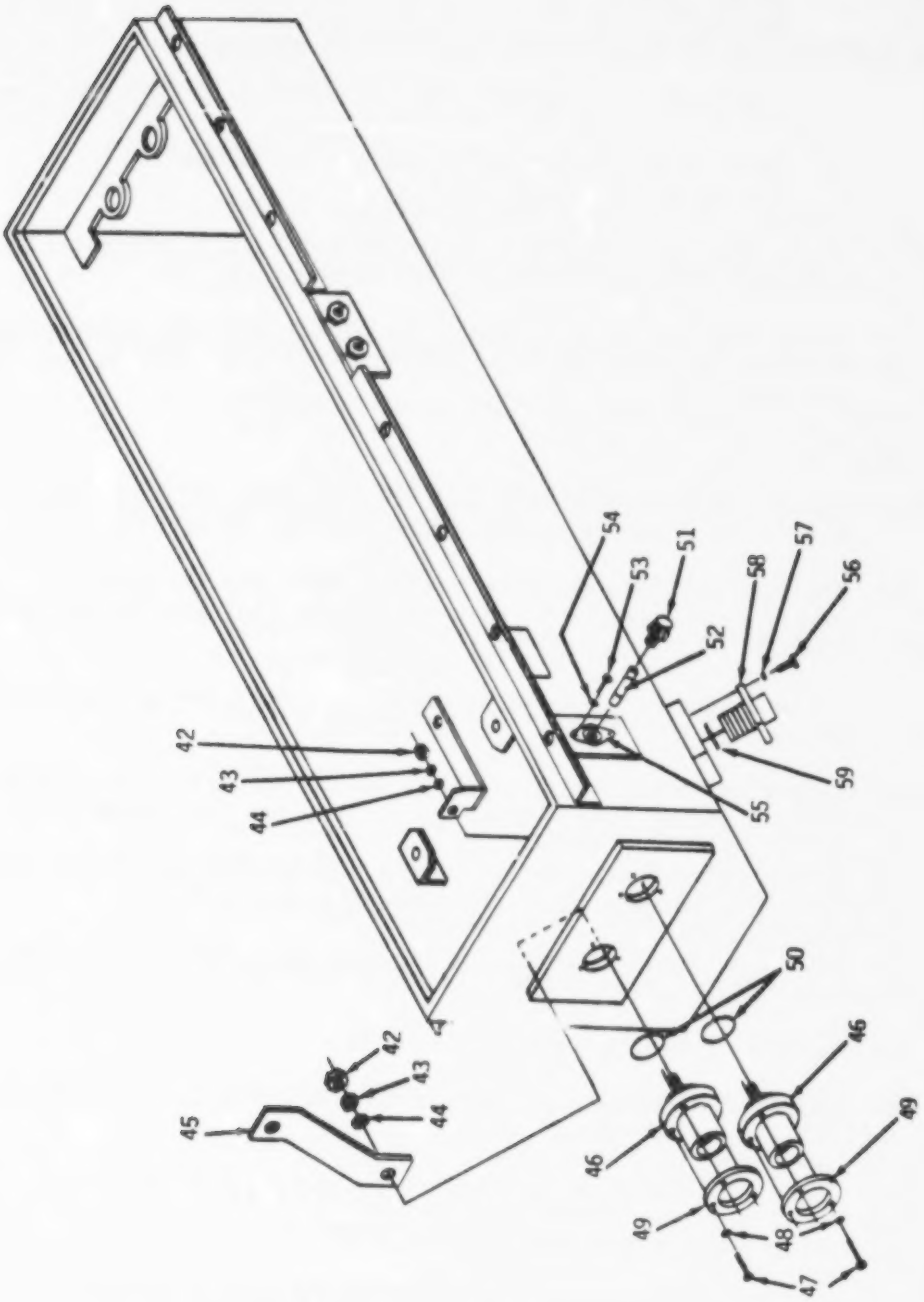


Figure 4-15. Housing, Hydraulic Unit (Sheet 2 of 2)

NOTE

Do not remove the fittings (35) from the hydraulic pump reservoir. Protect the fitting threads with tape or cap threads.

NOTE

When loosening the bolts (35) do not allow the motor to rotate.

(12) Remove the two nuts (36), lockwashers (37), and bracket (38) from the rear of the motor valve assembly (31).

(13) Loosen the two bolts (39) and remove the mounting bracket (40) from the front of the motor valve assembly by pushing down on the bracket.

b. Installation.

(1) Loosen the two bolts (39) and align bracket (40) onto the motor (31). Secure by tightening the two bolts (39).

(2) Position the rear mounting bracket (38) onto the pump reservoir and secure it with two screws (36) and lockwashers (37).

(3) Position the motor valve assembly (31) into the hydraulic box (6).

(4) Secure the motor valve assembly to the hydraulic box with two machine screws (28), lockwashers (29), and flat washer (30).

(5) Secure other end of motor valve assembly with two flat washers (34), lockwashers (33), and machine screws (32).

(6) Position tagged ground leads on post and secure with screw (13).

(7) Install hydraulic hoses (25 and 26).

(8) Secure the bus bar (24) with a machine screw (21), lockwasher (22), and flat washer (23).

(9) Install solenoid switch (reference paragraph 4-35b).

(10) Install cable ties (14).

(11) Install the hydraulic unit cover (reference paragraph 4-28c).

(12) Install the Electronic Control Unit (reference paragraph 4-19b).

(13) Install the cover assembly (reference paragraph 4-17b).

4-30. **FITTING, HYDRAULIC.** (See figure 4-15, sheet 1.)

a. Removal.

(1) Remove the cover assembly (reference paragraph 4-17a).

(2) Remove the Electronic Control Unit (reference paragraph 4-19a).

(3) Remove the hydraulic unit cover (reference paragraph 4-28a).

(4) Disconnect the hydraulic lines from the two hydraulic fittings (27).

(5) Remove the two fittings (27) and preformed packing (41) from the hydraulic box (6).

b. Installation.

(1) Install the two fittings (27) and preformed packing (41) into the hydraulic box (6).

(2) Connect the hydraulic lines to the hydraulic fittings (27).

(3) Install the hydraulic unit cover (reference paragraph 4-28c).

(4) Install the Electronic Control Unit (reference paragraph 4-19b).

(5) Install the cover assembly (reference paragraph 4-17b).

4-31. **RECEPTACLE, BATTERY CABLE ELECTRICAL.** (See figure 4-15, sheet 2).

a. Removal.

(1) Remove the cover assembly (reference paragraph 4-17a).

(2) Remove the hydraulic unit cover (reference paragraph 4-28a).

(3) Remove the nut (42), lockwasher (43), and flat washer (44) from the cable bus bars (24 and 45) and receptacle (46).

(4) Remove the three machine screws (47), lockwashers (48), and the battery washer (49) from the cable receptacle (46).

(5) Pull the cable receptacle (46) and preformed packing (50) from the hydraulic unit (6, sheet 1) cut-out.

b. Installation.

(1) Position preformed packing (50) onto the cable receptacle (46) and apply RTV sealant to screws (47).

(2) Install the cable receptacle (46) into the hydraulic unit box (6, sheet 1). Secure with a battery washer (49), three machine screws (47), and lockwashers (48).

(3) Secure the bus bar (24 and 45) with a flatwasher (44), lockwasher (43), and nut (42) to the cable receptacle.

(4) Install the hydraulic unit cover (reference paragraph 4-20c).

(5) Install the cover assembly (reference paragraph 4-17b).

4-32. HYDRAULIC HOSE. (See figure 4-15, sheet 1.)

a. Removal.

(1) Remove the cover assembly (reference paragraph 4-17a).

(2) Remove the hydraulic unit cover (reference paragraph 4-28a).

(3) Using a wrench, hold the hydraulic fittings (35) and loosen the hydraulic hose (25 and 26) with a second wrench.

(4) Using a wrench, hold the hydraulic fittings (27) and loosen the hydraulic hoses (25 and 26) with a second wrench.

(5) When both hydraulic fittings are free, remove the hoses (25 and 26).

b. Installation.

(1) Position the hoses (25 and 26) into the hydraulic box (6).

(2) Using a wrench, hold the fittings (35) and tighten the hydraulic hoses (25 and 26) with a second wrench.

(3) Using a wrench, hold the fittings (27) and tighten the hydraulic hose (25 and 26) with a second wrench.

(4) Install the hydraulic unit cover (reference paragraph 4-28c).

(5) Install the cover assembly (reference paragraph 4-17b).

4-33. FUSE HOLDER. (See figure 4-15, sheet 2.)

a. Removal.

(1) Remove the cover assembly (reference paragraph 4-17a).

4-33. FUSE HOLDER. (See figure 4-15, sheet 2.)

a. Removal.

(1) Remove the cover assembly (reference paragraph 4-17a).

(2) Remove the hydraulic unit cover (reference paragraph 4-28a).

(3) Remove the fuse cap (51) and the fuse (52).

(4) Remove the two machine screws (53) and lockwashers (54) that secure the fuse holder (55) to the hydraulic unit box (figure 4-15 sheet 1(6). Remove the fuse holder (55).

(5) Tag and unsolder the three electrical leads from the back of the fuse holder (55).

b. Installation.

(1) Solder the three tagged electrical leads to the fuse holder (55) (reference FO-11).

(2) Position the fuse holder (55) into the hydraulic box (figure 4-15 sheet 1 (6). and secure it with two machine screws (53) and lockwashers (54).

(3) Ensure that the proper fuse (52) is installed and secured with a cap (51) into the fuse holder (55).

(4) Install the hydraulic unit cover (reference paragraph 4-28c).

(5) Install the cover assembly (reference paragraph 4-17b).

(2) Remove the hydraulic unit cover (reference paragraph 4-28a).

(3) Tag and unsolder the two cable assembly leads attached to the fuse holder (55).

(4) Tag and disconnect the cable assembly leads from the suppression CCA (12), the solenoid switch (8), and the motor ground strap.

(5) Remove the four machine screws (56) and lockwashers (57) that secure cable assembly connector (58) to the hydraulic unit (6, sheet 1).

(6) Remove cable assembly connector (58) and the preformed packing (59) from the hydraulic unit (6, sheet 1).

b. Installation.

(1) Position the preformed packing (59) onto cable assembly connector (58).

(2) Position cable assembly connector (58) into the hydraulic unit (6, sheet 1) and secure it with four lockwashers (57) and machine screws (56).

(3) Solder the two tagged leads from cable assembly connector (58) to the fuse holder (55) (reference FO-11).

(4) Connect the tagged leads from the cable assembly connector to suppression CCA (12), solenoid switch (8), and the motor ground strap (reference FO-11).

(5) Install the hydraulic unit cover (reference paragraph 4-28c)

(6) Install the cover assembly (reference paragraph 4-17b).

4-35. SWITCH, SOLENOID. (See figure 4-15 sheet 1.)

a. Removal.

(1) Remove the cover assembly (reference paragraph 4-17a).

(2) Remove the cover from the hydraulic unit box (reference paragraph 4-28a).

(3) Tag and disconnect all the electrical leads from the solenoid (8) terminals (reference FO-11).

(4) Remove the nut (9) and flatwasher (10) that secure the bus bar (11) to the solenoid (8).

(5) Remove the nut (15), flat washer (16), circuit card (12), and bus bar (11).

(6) Remove the machine screw (20), flat washer (19), lockwasher (18), and nut (17) that secure the solenoid (8) to the bracket.

(7) Lift the solenoid (8) from the bracket and bus bar (11).

b. Installation.

(1) Position the solenoid (8) onto the bracket and secure with a machine screw (20), washer (19), a lockwasher (18), and a nut (17).

(2) Install the bus bar (11), circuit card (12), flatwasher (16), and nut (15).

(3) Secure the bus bar (11) to the solenoid (8) terminal with a flatwasher (10) and nut (9).

(4) Connect all the tagged electrical leads to the solenoid (8) terminals (reference FO-11).

(5) Install the hydraulic unit cover (reference paragraph 4-28c).

(6) Install the cover (reference paragraph 4-17b).

4-36. CIRCUIT CARD, SUPPRESSION. (See figure 4-15, sheet 1.)

a. Removal.

(1) Remove the cover (reference paragraph 4-17a).

(2) Remove the hydraulic unit cover (reference paragraph 4-28a).

(3) Tag and remove all the electrical leads attached to the suppression CCA (12).

(4) Remove the nut (15), and flat washer (16); then lift the suppression CCA (12) off of the motor post.

b Installation.

(1) Position the suppression CCA (12) onto the motor post and secure with a flat washer (16) and nut (15).

(2) Connect the tagged leads to the suppression CCA (reference FO-11).

(3) Install the hydraulic unit cover (reference paragraph 4-28c).

(4) Install the cover (reference paragraph 4-17b).

4-37. COVER, TRANSMITTER. (See figure 4-16.)

a. Removal.

(1) Rotate the cover (1) to expose four machine screws (2).

(2) Remove the four screws (2) from each corner plate (3). Remove the cover (1) and the corner plates (3) from the transmitter (4).

(3) Remove the two machine screws (5), the lockwasher (6), flatwasher (7), spacer (8), and nut (9) from the cover (1) and corner plates (3).

b. Installation.

(1) Place the corner plate (3) on the cover (1) and secure it with two nuts (9), spacers (8), flatwashers (7), lockwashers (6), and machine screws (5).

(2) Place the corner plate (3) with the cover (1) attached, onto the transmitter (4) and secure with four screws (2).

(3) Rotate the cover (1) to cover the controls on the transmitter (4).

4-38. **PLATE, TRANSMITTER BOTTOM** . (See figure 4-16.)

a. Removal.

(1) Lift the latches (10) and remove the bottom plate (11).

b. Repair.

(1) Remove the rubber gasket (12) from the bottom plate (11) with a putty knife.

(2) Scrape the old cement from the bottom plate (11) and clean the surface with denatured alcohol.

(3) Apply rubber cement to the bottom plate (11).

(4) Position a rubber gasket (12) onto the bottom plate (11) and allow the cement to dry.

c. Installation. Place the bottom plate (11) onto the transmitter (4) and secure with latches (10).

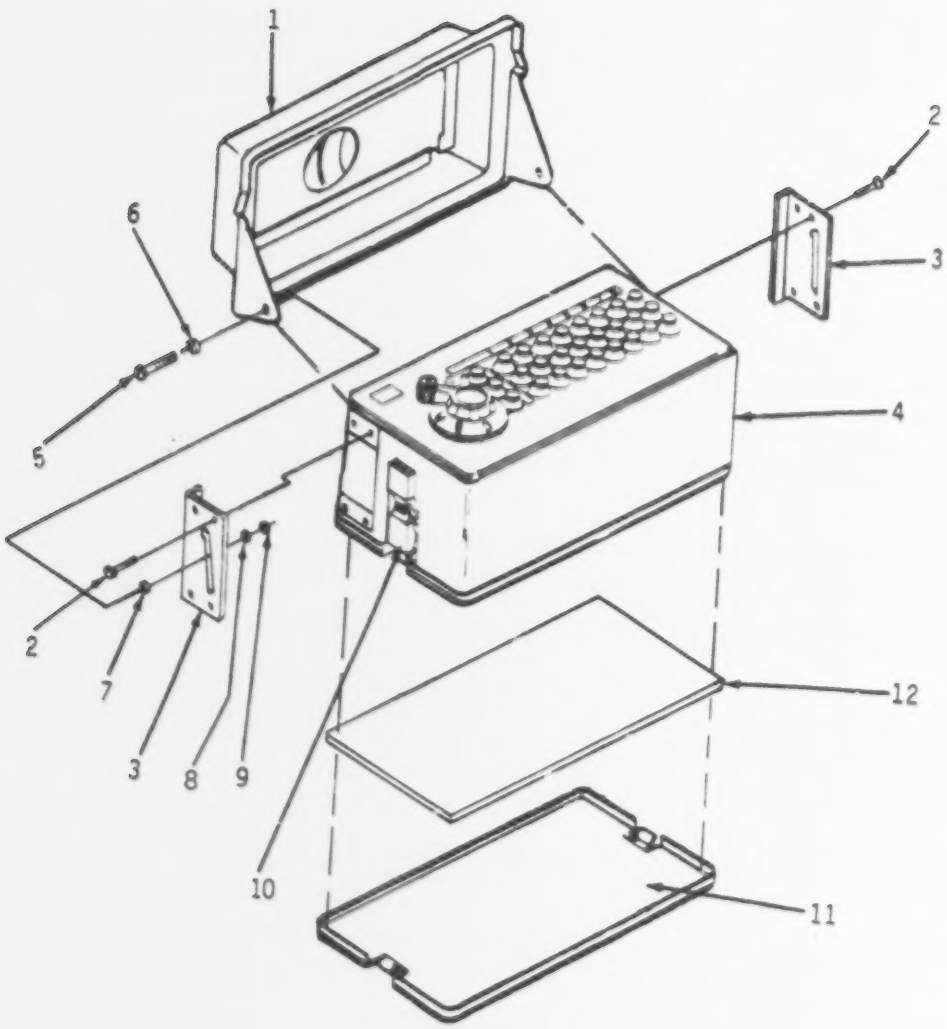


Figure 4-16. Transmitter Cover and Bottom Assembly

CHAPTER 5

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS, AND EQUIPMENT

5-1. SPECIAL TOOLS AND EQUIPMENT. There are no special tools and equipment required for direct support and general support maintenance of the Target Holding Mechanism/Tank Gunnery (THM/TG).

5-2. REPAIR PARTS. Direct support and general support maintenance repair parts are listed and illustrated in Appendix C, Repair Parts and Special Tools List, of this manual.

Section II. TROUBLESHOOTING

5-3. SCOPE.

a. This section contains troubleshooting or malfunction information and tests for locating and correcting most of the troubles which may develop in the THM/TG. Each malfunction or trouble symptom for an individual component, unit, or system has probable causes and suggested corrective actions to remedy the malfunction.

b. This manual cannot list all possible malfunctions that may occur or all tests, inspections, and corrective actions. If a malfunction is not listed (except when malfunction and cause are obvious), or is not corrected by listed corrective actions, you should notify higher level maintenance.

c. Table 5-1 lists the common malfunctions that you may find during the operation or maintenance of the THM/TG or its components. You should perform the test/inspections and corrective actions in the order listed.

NOTE

An operational THM/TG will be used as a test stand for troubleshooting the Electronic Control Unit in this procedure. An analog multimeter is also required.

NOTE

The 12 volt battery must be fully charged for this test.

NOTE

Begin troubleshooting procedures with Malfunction 1.

Table 5-1. THM/TG DS/GS Troubleshooting

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. ELECTRONIC CONTROL UNIT IS INOPERATIVE (see FO-11).

Step 1. Install the defective Electronic Control Unit (ECU) into the THM/TG. Connect P2 and P3 assemblies on the ECU. Connect the Lamp Assembly to the Electronic Control Unit Lamp connector ST3. Connect the hit sensor cable to the hit sensor jack.

Step 2. Set the SENSITIVITY switch to position 2 and the FUNCTION switch to position 1. Set the TEST switch to the UP position. The target arm should move to the UP position and remain up.

NOTE

If a target has not been installed on the THM/TG and the target UP position must be identified, reference should be made to the position of the shaft guide pin. The shaft guide pin will be at the "9 o'clock" position for the target UP position, and at the "11 o'clock" position for the target DOWN position.

If the target arm moves to the UP position, proceed to step 3.

If the target arm does not move to the UP position, proceed to Malfunction 2.

Step 3. Set the TEST switch to the DOWN position. The target arm should move to the DOWN position.

If the target arm moves to the DOWN position, proceed to step 4.

If the target arm does not move to the DOWN position, proceed to Malfunction 3.

Step 4. Set the FUNCTION switch to position 4. Set the TEST switch to the UP position. As the target arm begins to move upward the LAMP assembly should blink.

If the LAMP assembly blinks, proceed to step 5.

If the LAMP assembly does not blink, proceed to Malfunction 4.

Table 5-1. THM/TG DS/GS Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

Step 5. Tap the hit sensor on a solid surface. The LAMP assembly should flash and the target arm should remain up.

If the LAMP flashes and the target arm remains up, proceed to step 6.

If the LAMP does not flash, ensure that the SENSITIVITY ZONE switch is adjusted correctly. Then retest. If the SENSITIVITY ZONE switch is adjusted correctly, proceed to Malfunction 4.

If the target arm moves to the DOWN position, proceed to Malfunction 5.

Step 6. Set the FUNCTION switch to position 5 and tap the hit sensor on a solid surface. The LAMP assembly should flash and the target arm should move to the DOWN position, and remain down.

If the target arm moves to the DOWN position and remains down, proceed to step 7.

If the target arm does not move to the DOWN position, proceed to Malfunction 6.

Step 7. Set the FUNCTION switch to position 6. Set the SENSITIVITY switch to position 4 and the TEST switch to UP. After the target arm moves to the UP position, tap the hit sensor on a solid surface. The LAMP assembly should flash and the target arm should move to the DOWN position. Within 12 seconds, the target arm should move to the UP position and remain up.

If the target arm responds correctly, proceed to step 8.

If the target arm does not move to the DOWN position when hit, proceed to Malfunction 6.

If the target arm does not move to the UP position within 12 seconds $\pm$ 2 seconds, proceed to Malfunction 7.

Step 8. Set a multimeter to measure 2.5 VDC. Connect the positive lead to the ECU connector ST1 pin G and the negative lead to ground. Tap the hit sensor on a solid surface. The multimeter should deflect up scale.

Table 5-1. THM/TG DS/GS Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
		If the multimeter responds correctly, proceed to step 9. If the multimeter does not respond correctly, proceed to Malfunction 8.
	Step 9. Set a multimeter to measure ohms on the X100 scale. Connect the positive lead to ST2 pin M and the negative lead to ST2 pin N. Momentarily connect a jumper between ST2 pins K and E. The multimeter should indicate a short.	If the multimeter indicates a short, proceed to step 10. If the multimeter does not indicate a short, proceed to Malfunction 9.
	Step 10. Set a multimeter to measure ohms on the X100 scale. Connect the positive lead to ST1 pin M and the negative lead to ST1 pin N. Tap the hit sensor on a solid surface. The multimeter should indicate a short.	If the multimeter indication is correct, proceed to step 11. If the multimeter does not indicate a short, proceed to Malfunction 10.
	Step 11. Set the FUNCTION switch to position 6 and the SENSITIVITY switch to position 4. Set the TEST switch to the DOWN position. As the target arm responds to the TEST switch, the BATTERY lamp should steadily illuminate (not flash).	If the BATTERY lamp illuminates steadily, (not flash), proceed to step 12. If the BATTERY lamp flashes or does not illuminate, ensure that the battery is fully charged; then retest. If the BATTERY lamp still flashes or does not illuminate, proceed to Malfunction 11.

Table 5-1. THM/TG DS/GS Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

Step 12. Remove power and open the front cover on the Electronic Control Unit. Set a multimeter to measure ohms on the X10 scale. Check for continuity between the following points (see FO-11).

ST1 pin F	to	Logic CCA pin K
ST1 pin F	to	P1 connector pin F
ST1 pin D	to	Logic CCA pin E
ST1 pin D	to	P1 connector pin D

If the continuity is good, the Electronic Control Unit is operational. Replace cover.

If the continuity is bad, repair wiring as necessary and retest.

2. THM/TG TARGET ARM WILL NOT RESPOND TO THE UP COMMAND, USING THE TEST SWITCH.

Step 1. Set the FUNCTION switch to position 2 and the TEST switch to the UP position. The target arm should move to the UP position.

If the target arm moves to the UP position, the TEST switch circuits are operational.

If the target arm does not move to the UP position, proceed to step 2.

Step 2. Remove power. Using a screwdriver, remove the front panel from the Electronic Control Unit. This allows access to the circuit card assemblies (CCA).

Step 3. Turn power ON. Set a multimeter to measure 12 VDC. Connect the positive lead to the top of the Battery Check CCA connector pin 3 and the negative lead to ground (see FO-14).

Step 4. Set the TEST switch to the UP position. The multimeter indication should drop from 12 VDC + 1.5 VDC to 0 VDC $\pm$ 1 VDC and then returns to 12 VDC $\pm$ 1.5 VDC.

If the multimeter drops to 0 VDC + 1 VDC, remove power and check the continuity of the wiring between Battery Check CCA pin 3 and relay K6 (see figure 6-5, sheet 2); and between relay K6 and connector P2. Repair as necessary.

Table 5-1. THM/TG DS/GS Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

If the wiring is good, remove and replace relay K6 and retest.

If the multimeter continues to measure 12 VDC ± 1.5 VDC, proceed to step 5.

Step 5. Set a multimeter to measure 12 VDC. Connect the positive lead to the Logic CCA pin E and the negative lead to ground. Set the TEST switch to the UP position. The multimeter should measure 10 VDC ± 1.5 VDC as long as the TEST switch is in the UP position.

If the multimeter indication is correct, proceed to step 7.

If the multimeter does not measure 10 VDC ± 1.5 VDC, check the continuity of the wiring between the TEST switch and Logic CCA pin E. Repair as necessary and retest.

If the THM/TG still will not respond to the TEST switch, proceed to step 6.

Step 6. Turn power ON. Set a multimeter to measure 12 VDC. Connect the positive lead to TEST switch pin 2 and the negative lead to ground. The multimeter should indicate 12 VDC ± 1.5 VDC.

If the multimeter indicates 12 VDC ± 1.5 VDC, remove power. Replace the TEST switch and retest.

If the multimeter does not indicate 12 VDC ± 1.5 VDC, remove power and check the continuity between the TEST switch and FUNCTION switch contacts 1, 2, 3, and 4. Repair the wiring as necessary.

Step 7. Transfer the positive multimeter lead from pin E to pin M on the Logic CCA. Set the TEST switch to the UP position. The multimeter should measure 12 VDC ± 1.5 VDC; then drop to 0 VDC ± 1 VDC when the TEST switch is placed in the UP position, and then return to 12 VDC ± 1.5 VDC.

If the multimeter indication drops to 0 VDC ± 1 VDC, remove power and check the continuity between Logic CCA pin M and Battery Check CCA pin 4. Repair as necessary and retest.

Table 5-1. THM/TG DS/GS Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

If the wiring is good, remove and replace the Battery Check CCA and retest.

If the target arm still will not respond to the TEST switch, proceed to step 8.

If the multimeter continues to measure 12 VDC + 1.5 VDC, remove power and replace the Logic CCA. Retest for target arm response to the TEST switch.

Step 8. Set the multimeter to measure 12 VDC. Connect the positive lead to the Logic CCA pin N and the negative lead to ground. Set the TEST switch to the UP position. The multimeter should indicate 12 VDC; then drop to 0 VDC ± 1 VDC when the TEST switch is placed in the UP position and then return to 12 VDC ± 1.5 VDC.

If the multimeter drops to 0 VDC + 1 VDC, remove power and check the continuity between the Logic CCA pin N and the Motor relay K3. Check the continuity, between relay K3 and connector P2. Repair wiring as necessary and retest.

If the multimeter does not indicate 0 VDC + 1 VDC, remove power and replace the Logic CCA. Retest.

3. THM/TG TARGET ARM WILL NOT RESPOND TO THE DOWN COMMAND FROM THE TEST SWITCH.

Step 1. Set the FUNCTION switch to position 2 and the TEST switch to the DOWN position. The target arm should move to the DOWN position.

If the target arm moves to the DOWN position, the TEST switch circuits are operational.

If the target arm does not move to the DOWN position, proceed to step 2.

Step 2. Remove power. Using a screwdriver, remove the front panel from the Electronic Control Unit. This allows access to circuit card assemblies (CCA).

Step 3. Turn power ON. Set a multimeter to measure 12 VDC. Connect the positive lead to the top of the Battery Check CCA connector pin 1 and the negative lead to ground (see FO-14).

Table 5-1. THM/TG DS/GS Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	Step 4. Set the TEST switch to the DOWN position. The multimeter indication should drop from 12 VDC + 1.5 VDC to 0 VDC ± 1 VDC, and then return to 12 VDC ± 1.5 VDC.	If the multimeter drops to 0 VDC + 1 VDC, remove power and check the continuity of the wiring between Battery Check CCA pin 1 and relay K2, and between relay K2 and connector P2. Repair as necessary. If wiring is good, remove and replace relay K2 and retest. If the multimeter continues to measure 12 VDC ± 1.5 VDC, proceed to step 5.
	Step 5. Set a multimeter to measure 12 VDC. Connect the positive lead to the Logic CCA pin K and the negative lead to ground. Set the TEST switch to the DOWN position. The multimeter should measure 10 VDC + 1.5 VDC as long as the TEST switch is in the DOWN position.	If the multimeter indication is correct, proceed to step 7. If the multimeter does not measure 10 VDC + 1.5 VDC, check the continuity of the wiring between the TEST switch and Logic CCA pin K. Repair as necessary and retest. If the THM/TG still will not respond to the TEST switch, proceed to step 6.
	Step 6. Turn power ON. Set a multimeter to measure 12 VDC. Connect the positive lead to TEST switch pin 2 and the negative lead to ground. The multimeter should indicate 12 VDC ± 1.5 VDC.	If the multimeter indicates 12 VDC + 1.5 VDC, remove power. Replace the TEST switch and retest. If the multimeter does not indicate 12 VDC + 1.5 VDC, remove power and check the continuity between the TEST switch and FUNCTION switch contacts 1, 2, 3, and 4. Repair wiring as necessary.

Table 5-1. THM/TG DS/GS Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

Step 7. Transfer the positive multimeter lead from pin P to pin R on the Logic CCA. Set the TEST switch to the DOWN position. The multimeter should measure 12 VDC + 1.5 VDC; and then drop to 0 VDC + 1 VDC when the TEST switch is placed in the DOWN position.

If the multimeter indication drops to 0 VDC + 1 VDC, remove power and check the continuity between Logic CCA pin M and Battery Check CCA pin 2. Repair as necessary and retest.

If the wiring is good, remove and replace the Battery Check CCA and retest.

If the target arm still will not respond to the TEST switch, proceed to step 8.

If the multimeter continues to measure 12 VDC + 1.5 VDC, remove power and replace the Logic CCA. Retest for target arm response to the TEST switch.

Step 8. Set the multimeter to measure 12 VDC. Connect the positive lead to Logic CCA pin N and the negative lead to ground. Set the TEST switch to the UP position. The multimeter should indicate 12 VDC; then drop to 0 VDC + 1 VDC when the TEST switch is placed in the UP position.

If the multimeter measures 0 VDC + 1 VDC, remove power and check the continuity between Logic CCA pin N and Motor relay K3. Check the continuity between relay K3 and connector P2. Repair wiring as necessary and retest.

If the multimeter does not indicate 0 VDC + 1 VDC, remove power. Replace the Logic CCA and retest.

4. LAMP ASSEMBLY DOES NOT FLASH WHEN HIT OCCURS.

Step 1. Set the FUNCTION switch to position 6. Set the TEST switch to the UP position. As the target arm moves upward, the LAMP assembly should blink.

If the LAMP assembly blinks, proceed to step 3.

If the LAMP assembly does not blink, proceed to step 2.

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Table 5-1. THM/TG DS/GS Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION CORRECTIVE ACTION
	Step 2. Disconnect the LAMP assembly from ST3. Set a multimeter to measure 12 VDC ± 1.5 VDC. Connect the positive lead to ST3 pin B and the negative lead to ground. Set the TEST switch to the UP position. The multimeter should measure 12 VDC ± 1.5 VDC. If the multimeter indication is correct, repair the lamp assembly. If the multimeter does not measure 12 VDC ± 1.5 VDC, remove power and check the continuity between ST3 pin B and relay K5. Check the continuity between relay K5 and TEST switch pin 1. Repair the wiring as necessary.
	Step 3. Set the TEST switch to the UP position. Connect a hit sensor to hit sensor jack 1. Tap the hit sensor on a solid surface. As the target arm starts to move downward, the LAMP assembly should flash. If the LAMP flashes, the lamp circuits are operational. If the LAMP assembly does not flash, proceed to step 4.
	Step 4. Remove power. Using a screwdriver, remove the front panel from the Electronic Control Unit. This will permit access to the circuit card assemblies (CCA).
	Step 5. Set a multimeter to measure 12 VDC. Connect the positive lead to Logic CCA pin B and the negative lead to ground. Tap the hit sensor. The multimeter should indicate 10 VDC ± 1.5 VDC. If the multimeter indication is correct, remove power and check the continuity between Logic CCA pin B and the FUNCTION switch deck C. Also check the continuity between deck C and relay K5. Repair wiring as necessary and retest. If the multimeter does not indicate 10 VDC ± 1.5 VDC, proceed to step 6.

Table 5-1. THM/TG DS/GS Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

Step 6. Set the multimeter to measure 2.5 VDC. Transfer the positive lead to the Logic CCA pin X. Tap the hit sensor on a solid surface. The multimeter should deflect up scale.

If the multimeter deflects up scale, remove power. Replace the Logic CCA and retest.

If the multimeter does not deflect up scale, remove power. Replace the Amplifier CCA and retest.

If the multimeter still does not deflect up scale, remove power. Check the continuity between the Amplifier CCA and the Logic CCA (see FO-11). Repair as necessary and retest.

If the multimeter still does not deflect up scale, remove power. Check the continuity between the hit sensor jacks and the Amplifier CCA.

5. THE THM/TG TARGET ARM MOVES DOWNWARD WHEN THE FUNCTION SWITCH IS SET TO POSITIONS 1 AND 4, AND THE TARGET IS HIT.

Step 1. Ensure that the FUNCTION switch is set to position 1. Tap the hit sensor on a solid surface. The LAMP assembly should not flash and the target arm should remain in the UP position.

If the LAMP does not flash and the target arm remains up, proceed to step 2.

If the LAMP assembly flashes, proceed to Malfunction 4.

If the target arm moves downward, remove power. Replace the Logic CCA and retest.

If the target arm still moves downward, remove power. Check the continuity on the FUNCTION switch deck B (see FO-11) and retest.

If the FUNCTION switch is defective, evacuate the Electronic Control Unit to the next higher level of maintenance.

Table 5-1. THM/TG DS/GS Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION CORRECTIVE ACTION

Step 2. Set the FUNCTION switch to position 4. Tap the hit sensor on a solid surface. The LAMP assembly should flash and the target arm should remain UP.

If the LAMP assembly does not flash, proceed to Malfunction 4.

If the target arm moves downward, remove power. Replace the Logic CCA and retest.

If the target arm still moves downward, remove power. Check the continuity on the FUNCTION switch deck B (see FO-11).

If the FUNCTION switch is defective, evacuate the Electronic Control Unit to the next higher level of maintenance.

6. THE THM/TG WILL NOT RESPOND TO HITS.

Step 1. Ensure that the FUNCTION switch is in position 5. Open the front cover on the Electronic Control Unit.

Step 2. Ensure that the target arm is in the UP position. Set a multimeter to measure 12 VDC. Connect the positive lead on Logic CCA pin R, and the negative lead to ground.

Step 3. Tap the hit sensor on a solid surface. The multimeter should measure 12 VDC; then drop to 0 VDC $\pm$ 1 VDC when the hit sensor is tapped.

If the multimeter indication drops to 0 VDC $\pm$ 1 VDC, proceed to step 4.

If the multimeter continues to indicate 12 VDC $\pm$ 1.5 VDC, proceed to step 6.

Step 4. Transfer the positive multimeter lead from Logic CCA pin R to Battery Check CCA pin 1. Tap the hit sensor on a solid surface. The multimeter indication should drop to 0 VDC $\pm$ 1 VDC.

If the multimeter indication drops to 0 VDC + 1 VDC, remove power. Check the continuity between the Battery Check CCA pin 1 and relay K2. Check the continuity between relay K2 and connector P2 pin F (see FO-1 and FO-14). Repair wiring as necessary.

Table 5-1. THM/TG DS/GS Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION CORRECTIVE ACTION
	If the wiring is good, replace the K2 relay. If the multimeter does not drop to 0 VDC ± 1 VDC, proceed to step 5.
Step 5.	Transfer the positive multimeter lead from Battery Check CCA pin 1 to pin 2. Tap the hit sensor on a solid surface. The multimeter indication should drop from 12 VDC (± 1.5 VDC) to 0 VDC. If the multimeter indication drops to 0 VDC ± 1 VDC, remove power. Replace the Battery Check CCA and retest. If the multimeter indication does not drop to 0 VDC ± 1 VDC, remove power and check the continuity between Logic CCA pin R and Battery Check CCA pin 2. Repair as necessary and retest.
Step 6.	Ensure that the target arm is in the UP position and that the FUNCTION switch is in position 5. Set multimeter to measure 2.5 VDC. Connect the positive lead on the Logic CCA pin X and the negative lead to ground. Tap the hit sensor on a solid surface. The multimeter should deflect up scale. If the multimeter deflects up scale, remove power. Replace the Logic CCA and retest. If the multimeter does not deflect up scale, remove power. Replace the Amplifier CCA and retest. If the multimeter still does not deflect up scale, remove power. Check the continuity between the hit sensor connectors and the Amplifier CCA. Check the continuity between the Amplifier CCA and the Logic CCA. Repair as necessary, and retest.
Step 7.	Ensure that the target arm is in the UP position. Ground pin D on any hit sensor connector. The target arm should move to the DOWN position and remain DOWN as long as pin D is grounded. If the target arm moves to the down position, proceed to step 8.

Table 5-1. THM/TG DS/GS Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

If the target arm does not move to the DOWN position, remove power. Remove and replace the Amplifier CCA, and retest.

If the target arm still does not move to the DOWN position, remove power and replace the original Amplifier CCA. Remove and replace the Control Logic CCA and retest.

If the target arm still does not move DOWN, remove power and replace the original Control Logic CCA. Check continuity between Hit Sensor jacks and Amplifier CCA. Repair wiring as necessary. Retest.

Step 8. Set a multimeter to measure 12 VDC. Connect the positive lead to pin N on the Amplifier CCA and the negative lead to ground (see FO-11). Place the SENSITIVITY switch in the positions indicated below. Note the corresponding voltage readings.

Sensitivity Switch Position	Required Voltage Measurement
1	1.5 VDC ± .15 VDC
2	4 VDC ∓ 1 VDC
3	6.5 VDC ∓ 1.5 VDC
4	8 VDC ∓ 1.5 VDC

If the multimeter indication is correct, the SENSITIVITY switch is operational.

If the multimeter does not indicate any voltage, remove power. Check the continuity between the SENSITIVITY switch and the Amplifier CCA. Repair as necessary and retest.

If continuity is good, proceed to step 9.

If voltage reading is incorrect in any position, remove power. Replace the resistor connected to the SENSITIVITY switch and retest.

Step 9. Turn power ON. Set a multimeter to measure 12 VDC. Connect the positive lead to SENSITIVITY switch pin 9 and the negative lead to ground. The multimeter should indicate 12 VDC ± 1.5 VDC.

Table 5-1. THM/TG DS/GS Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION CORRECTIVE ACTION
	If the multimeter indication is correct, a defective SENSITIVITY switch is indicated. Evacuate the electronic control unit to the next higher level of maintenance. If the multimeter does not indicate 12 VDC ± 1.5 VDC, remove power. Check continuity between the SENSITIVITY switch and FUNCTION switch contacts 2 and 1. Repair wiring as necessary and retest. If the continuity check indicates a defective FUNCTION switch, evacuate the Electronic Control Unit to the next higher level of maintenance. If the target arm moves to the DOWN position, the hit fault circuits are operational. If the target arm does not move to the DOWN position, remove power. Replace the Amplifier CCA and retest.
7. THE THM/TG TARGET ARM DOES NOT AUTOMATICALLY MOVE TO THE UP POSITION WHEN THE FUNCTION SWITCH IS IN POSITIONS 3 OR 6.	
	Step 1. Set the FUNCTION switch to position 6 and the SENSITIVITY switch to position 4. Tap the hit sensor on a solid surface. The target arm should move to the DOWN position. After 12 seconds the target arm should move to the UP position. If the target arm responds correctly, the automatic raise circuits are operational. If the target arm does not move to the DOWN position, proceed to Malfunction 6. If the target arm does not automatically move to the UP position after 12 seconds, remove power. Replace the Logic CCA and retest.
8. RCS DOES NOT RECEIVE HIT INFORMATION FROM THM/TG.	
	Step 1. Remove power. Remove the front cover on the Electronic Control Unit. Step 2. Turn on power. Set a multimeter to measure 2.5 VDC. Connect the positive lead to the Control Logic CCA pin Y and the negative lead to ground.

Table 5-1. THM/TG DS/GS Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION CORRECTIVE ACTION

Step 3. Ensure that the target arm is UP. Tap the hit sensor on a solid surface. The multimeter should deflect up scale.

If the multimeter deflects up scale, proceed to step 4.

If the multimeter does not deflect up scale, check the setting of the SENSITIVITY ZONE switch S3 and ensure it is adjusted correctly. Then retest.

If SENSITIVITY ZONE switch is adjusted correctly, remove power and remove and replace the Control Logic CCA. Retest.

9. THE HOSTILE FIRE SIMULATOR DOES NOT FIRE WHEN A HIT OCCURS.

Step 1. Ensure that the FUNCTION switch is set to position 6. Set a multimeter to measure ohms to the X10 scale. Connect the positive lead to ST2 pin M and the negative lead to ST2 pin N. Momentarily connect a jumper wire between ST2 pins K to E. The multimeter should indicate a short.

If the multimeter indicates a short, remove power. Check the continuity between ST2 pin E and P1 pin E. Repair as necessary and retest.

If the continuity is good, Hostile Fire circuits are operational.

If the multimeter does not indicate a short, remove power. Check the continuity between ST2 pin E and Hostile Fire relay K4, contacts 6, 7, 9, and 10 and ST2 pins M and N. Repair as necessary and then retest.

If the continuity is good, replace relay K4 and retest.

10. TKS WILL NOT FIRE IN RETS CONFIGURATION

Step 1. Remove power and open the front cover on the Electronic Control Unit. Check continuity between the following points:

Table 5-1. THM/TG DS/GS Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

a. Logic CCA pin B to Relay K1 pin 1

b. ST1 pin M to Relay K1 pins 6 and 9

c. ST1 pin N to Relay K1 pins 7 and 10

Repair wiring as necessary and retest.

If continuity is good, replace relay K1 and retest.

11. THE BATTERY LAMP FLASHES OR DOES NOT ILLUMINATE.

Step 1. Ensure that the Battery is fully charged and that the cables are clean and tight.

Step 2. Set the FUNCTION switch to position 6. Set the TEST switch first to the UP position; then to the DOWN position. As the target arm moves in response to the TEST switch the BATTERY LAMP should illuminate (not flash).

If the BATTERY LAMP illuminates (not flash), the battery circuits are operational.

If the BATTERY LAMP flashes, remove power. Replace the Battery Check CCA and retest.

If the BATTERY LAMP does not illuminate, remove power. Replace the Battery Check CCA and retest.

12. LIMIT SWITCH CABLE P3 IS INOPERATIVE.

NOTE

This procedure is to be used to isolate defective limit switches and/or Cable P3. The cable does not have to be connected to the THM/TG for this procedure.

Step 1. Set a multimeter to measure ohms to the X10 scale. Connect the positive lead to P3 pin B and the negative lead to pin A. The multimeter should indicate maximum ohms. Insert a putty knife blade between S2's limit switch legs and the multimeter should measure a short.

If the multimeter indication is correct, proceed to step 2.

Table 5-1. THM/TG DS/GS Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

Step 2. Set the FUNCTION switch to position 6. Set the TEST switch first to the UP position; then to the DOWN position. As the target arm moves in response to the TEST switch the BATTERY LAMP should illuminate (not flash).

If the BATTERY LAMP illuminates (not flash), the battery circuits are operational.

If the BATTERY LAMP flashes, remove power. Replace the Battery Check CCA and retest.

If the BATTERY LAMP does not illuminate, remove power. Replace the Battery Check CCA and retest.

12. LIMIT SWITCH CABLE P3 IS INOPERATIVE.

NOTE

This procedure is to be used to isolate defective limit switches and/or Cable P3. The cable does not have to be connected to the THM/TG for this procedure.

Step 1. Set a multimeter to measure ohms to the X10 scale. Connect the positive lead to P3 pin B and the negative lead to pin A. The multimeter should indicate maximum ohms. Insert a putty knife blade between S2's limit switch legs and the multimeter should measure a short.

If the multimeter indication is correct, proceed to step 2.

If the multimeter indication is incorrect replace S2 (reference paragraph 6-22).

Step 2. Set a multimeter to measure ohms to the X10 scale. Connect the positive lead to P3 pin C and the negative lead to pin A. The multimeter should indicate maximum ohms. Insert a putty knife blade between S1's limit switch legs and the multimeter should measure a short.

If the multimeter indication is correct, proceed to step 3.

If the multimeter indication is incorrect, replace S1 (reference paragraph 6-22).

Table 5-1. THM/TG DS/GS Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

Step 3. Set a multimeter to measure ohms to the X10 scale. Connect the positive lead to P3 pin D and the negative lead to pin A. The multimeter should indicate maximum ohms. Insert a putty knife blade between S3's limit switch legs and the multimeter should measure a short.

If the multimeter indication is correct, proceed to step 4.

If the multimeter indication is incorrect, replace S3 (reference paragraph 6-22).

13. THE HIT SENSOR INOPERATIVE.

Step 1. Disconnect the sensor from the hit sensor cable (reference paragraph 6-2a).

Step 2. Set a multimeter to measure ohms on the X10 scale. Connect the multimeter to the hit sensor cable and check continuity.

If continuity is good, replace the hit sensor and retest.

If the multimeter indicates an open, repair the cable and retest.

5-4. OCD/TRANSMITTER GENERAL BLOCK THEORY. (See FO-1.)

a. The OCD/transmitter consists of three circuit card assemblies (CCAs): a mother-board which contains the interconnecting wiring for the unit and comprises the front panel channel/function selectors and the RF-BATTERY lamp; a logic card that produces the command modulations; and a high frequency card which uses a crystal controlled oscillator to produce the carrier signal and modulation.

b. The crystal controlled oscillator can be switched between five different crystal controlled frequencies. The frequency selection is controlled by the channel selector on the OCD/transmitter logic CCA. The frequency is determined by six reed switches, activated two at a time by two permanent magnets in the Channel Selector knob.

c. Transmitter command functions are generated on the logic CCA by the ON/OFF circuits, Decode Counter, 3-Bit Coder, Parallel to Serial Converter, Message Coder, and FS Modulator. The Decode Counter is clocked by the Clock Pulse Generator. As a result of this clocking action, the Decode Counter scans the function switches at a 1MHz rate. As a function (FIRE, target UP, or target DOWN) is selected, the Decode Counter senses the closed switch and sends a pulse into the 3-Bit Coder. The command word, developed by the function switches and temporarily stored in the 3-Bit Coder, is comprised of 6 Bits. Bits 1 and 2 define the function, Bits 3, 4, and 5 identify the receiver address, and Bit 6 identifies the receiver group.

d. The command word is then clocked into the Parallel to Serial Converter. From the converter, the word is clocked (in Serial Form) to the Message Coder. This turns on the FS Modulator and produces one of two modulating signals. One signal is 2.6 KHz, which represents a logic "1"; the other signal is 1.95 kHz, which represents a logic "0".

e. Modulation Amplifier. The output from the FS Modulator is routed to the Modulation Amplifier. The Frequency Shift Modulated Signal is mixed with the Crystal Oscillator's carrier in the Frequency Modulator. The FS is FM'd onto the carrier signal.

f. Tripler/Doubler Circuit. The carrier is then fed to a Tripler/Doubler circuit which multiplies the input by 24. The signal is then amplified by the Driver and Power Amplifier Stage.

g. Antenna/RF Indicator. From the Power Stage the signal is routed to two places. First it is sent to the antenna filter and then to the antenna for transmission. Secondly, the signal is sent to the RF indication circuits. A signal is developed that is fed to the logic CCA and the RF-BATTERY indication circuit. This signal turns on the RF lamp during transmission.

h. Voltage Regulator and Stabilizer. The Voltage Regulator and the Voltage Stabilizer on the HF CCA and the logic CCA, respectively, provide operational voltages for the two CCAs. The transmit/stop circuit ensures that the function selected by the ON/OFF circuit is present for .6 seconds.

5-5. DETAILED OPERATION OF THE HIGH FREQUENCY CCA. (See FO-2).

a. Crystal Oscillator. The transmitter frequency is selected by the channel select circuits on the OCD/Transmitter Logic CCA (see FO-4). As a channel is selected, a +10 VDC is applied to one of the following pins on the High Frequency CCA.

J903, pin 11 - Channel A
pin 12 - Channel B
pin 13 - Channel C
pin 14 - Channel D
pin 15 - Channel E

Assume Channel 1 has been selected. A +10 VDC is applied to J903 pin 11. This voltage is then applied to Channel 1, Channel Transmitter Unit pin 4. The +10 VDC forward biases the diode CR601, allowing the tank circuit consisting of L601, R601, C601, and Crystal Y631 to control the frequency of the oscillator.

The crystal controlled oscillator consists of transistor Q201, connected as a Colpitts oscillator. The operating voltage for the oscillator is received from the Voltage Regulator. The Regulator consists of two parts. One part is made up of Q401, Q403, and Q405. This portion of the regulator supplies a regulated voltage of +10 VDC to all stages of the OCD, except the driver and the final stages. This stage of the regulator, in turn, receives its operating voltage via J903, pin 2. The +10 VDC is applied to J903 pin 2 when the FIRE, UP, or DOWN pushbuttons are pressed. The other part of the voltage regulator consists of Q407, Q409, Q411, and Q413. It supplies the driver and the final stage with a regulated voltage of +12 VDC. This portion of the regulator is activated when the battery is plugged into the transmitter.

b. Frequency Modulator. The data output from pin 35, on the OCD/Transmitter Logic CCA, is 2.6 kHz for a logic "1" or 1.95 kHz for a logic "0". This data stream is applied to the High Frequency CCA at J903 pin 6. From there it is applied to the Modulator Amplifier consisting of Q305 and Q307. Transistor Q309, with its attendant RC network, forms an active, low-pass filter with a cut off of 3 kHz. The input level to the Frequency Modulator is controlled by R343.

The output from the Crystal Oscillator is fed into the Frequency Modulator. The Modulator also receives the frequency shift key (FSK) signal from the OCD/Transmitter Logic CCA. This FSK signal is applied across the cascade-connected varactor diodes D201, D203 and D240 and phase-modulates the transmitter carrier signal. The phase-modulation has all the characteristics of frequency modulation.

c. Voltage Multiplier. The frequency modulated signal from the frequency modulator is multiplied 24 times in four stages, to obtain the correct carrier frequency. The frequency is tripled in stage Q205. From there, the signal is fed to a bandpass filter to stage Q207 where the frequency is doubled. The signal passes through two more doublers, connected in push-pull, in order to obtain sufficient suppression of the input frequencies. After the last doubler, the signal is fed thrcugh a bandpass filter (T225, T227) to the driver.

d. Driver Stage. The driver stage Q217 amplifies the 100 milliwatt signal from the last doubler to an output power of approximately 0.8 watts.

e. Power Stage. The power stage of Q101 amplifies the signal to the final output of 6 watts. As the signal goes out to the antenna, it passes through two filters (L901, L903) to suppress the harmonics.

f. RF Indication. The RF indication circuit comprised of R901, D901, and C903 provides a DC voltage of at least 3 VDC to the RF-battery indication circuits on the OCD/Transmitter Logic CCA pin 33. The circuit receives input from the power stage and causes the front panel RF-BATTERY lamp to illuminate during transmission.

5-6. DETAILED OPERATION OF THE LOGIC CCA (See FO-3).

a. Channel Selection. Channel selection is controlled by the Channel Select knob and transistor Q1 on the mother-board. Channel selection is accomplished by feeding a logic "high" to two of three inputs on the NAND gates, IC2 and IC3. The third input to the selected NAND gates is provided by an inverter (IC1) connected to the reed switch located between the two activated reed switches. The inverter (IC1) inverts the Low from the open reed switch to a logic "high" and applies it to the selected NAND gate. When all inputs to the NAND gate for the selected channel are "high", the resultant Low output activates the corresponding transistors, Q13 through Q17.

As an example, if Channel A is selected, reed elements K1 and K3 are closed. IC9 receives two of the necessary three "Hi" inputs on pins 1 and 2. The third input is received from inverter IC1-9 and the open reed element K2, which is located between the two activated reed elements. Diode CR3 and output A8 are used for external control. The Low output from IC4-2 turns on transistor Q13, providing current to the Channel Transmitter Unit located on the High Frequency CCA (see FO-3). This current forward biases the diode in the Channel Unit, placing the crystal into the tank circuit of the oscillator, thereby controlling its frequency.

Reed Switch Connections

Channel	Reed Element
A	K1 & K3
B	K2 & K4
C	K3 & K5
D	K4 & K6
E	K1 & K5

b. Voltage Stabilizer and RF-Buffer Indicator. Integrated circuits IC1 through IC4 makeup a series regulator which is supplied with power as soon as the battery is installed. The other circuits are powered by the voltage stabilizer, consisting of Q1 through Q6. When a channel frequency is selected and a function buffer is depressed, a +12 VDC is applied to pin A20. Q1 starts conducting and the entire regulator receives operating voltage. As a part of the stabilizer, Q4 starts conducting and develops a voltage drop across R44, holding the IC5 reset.

During transmission, a positive voltage of 3 VDC is also applied to the Logic CCA on pin B3 and routed to the base of Q7. Transistor Q7 conducts, causing Q9 to cut off and the front panel RF-BATTERY lamp to illuminated. If the battery voltage decreases, the applied voltage to the stabilizer circuit approaches the 10 VDC regulated out. This results in a decreased voltage drop across R11, causing Q4 to cut off. With Q4 cut off, IC5 can respond to the

the clock it receives from IC12-Q-14. IC12 clocks IC5 at a rate of 16.4 ms. IC5's output at Q5 is at a rate of 525 ms. This signal is applied to Q8, causing Q8 to conduct. As Q8 conducts, it shorts the resistor R42, applying a ground to the base of Q7. Q7 conducts and cuts off as controlled by IC5's output. This causes the RF-BATTERY lamp to flash at a 2 Hz rate during transmission.

c. Transmitter Word Generation. IC18 and IC14 are reset at power on. IC18 is clocked every millisecond by binary counter IC12-Q10. Every 10th clock pulse received by IC18 produces a carry bit, which in turn clocks IC14 and resets IC18 back to State "0". If the FIRE button for Receiver No. 8 was depressed each time IC18 reached state "7", a "high" will be felt at IC13, pin 5. Flip-flops IC14 are clocked by the carry from IC18. When IC14 is SET, SET, IC13 pins 3 and 4 are "high". As IC18 cycles through its count again, IC13 pin 5 will go "high" when IC18 reaches state "7". IC13 pin 6 goes "low" causing IC21-13 to go "high" and in turn IC20-10 goes "low". Inverter IC20-10 applies a "low" to the E input on IC18; then it stops. IC18 is now in position 7 and IC14 is SET, SET.

If an UP button had been pressed, IC18 will be stopped when IC14 is SET, RESET. This trues up IC13-9. If a DOWN button is pressed, IC18 will stop when IC14 is RESET, SET. This trues IC13-10.

The "low" from IC20-10 is felt back to IC21-12 through an RC-network with a time constant of 0.6 seconds. This will ensure that the pulse time will be of at least .6 seconds in length, even if the button is released earlier. The "highs" from IC14 are also felt at gates IC15-3 and IC15-4 forming bits 1 and 2 of the 6-bit transmitter word.

With transmitter command buttons pressed for receiver 8, "highs" are fed to IC17 pin 5; IC19 pin 4; and IC17 pin 12. IC20 pins 2, 4, and 6 go "high" and feed their outputs to IC 22 pins 6, 9, and 1, forming Bits 3, 4 and 5, respectively. For each individual pushbutton setting, a fixed combination of "highs" are fed to gates IC17 and IC19, which then set the corresponding transmitter word bit. If a button for the 1-8 receiver group is pressed, a "high" is fed directly to IC22-12.

Decade counter IC16 is clocked every 16.4 milliseconds by IC12 and is reset by a "high" from IC15-11. Flip-flops IC11-4 and IC11-10 are thus reset since the output of Q0 on IC16 is "high.". As IC18 is stopped, IC20-12 goes "high" causing IC15-11 to go "low". This allows IC16 to start counting. IC16 clocks the gates IC15-3, IC15-4, IC22-7, IC22-10, IC22-3, and IC22-11 for 16.4 milliseconds each. The message order is: Bits 1 and 2 (function), Bits 3, 4 and 5 (receiver number), and Bit 6 (receiver group). If the parallel/serial converter is trued, IC21-1 will go "high"; this "high" is fed to IC9, pin 12. When IC16 reaches state 7, it sets flip-flop IC11-4 and IC11-10, thus IC15-11 goes "low" on pin 13 and IC16 repeats the scanning sequence. This will continue as long as the button is pressed or for .6 seconds. Then IC16 is reset and held reset by a "low" from IC20-12.

The "high" from IC20-12 that started the scanning action of IC16, is also fed to IC15 pin 8. Q18 begins to conduct and feeds +10 VDC B4 to the Voltage Regulator in the High Frequency CCA. This allows the transmitter oscillator to begin oscillations.

d. Frequency Shift Modulation Circuits. The logic CCA sequence is controlled by clock pulses from a crystal controlled oscillator comprised of transistor Q10 and crystal Y1. The oscillator frequency is 1 mHz.

Transistor Q12 controls the frequency shift modulation of the transmitted signal. The relative duration of on and off time for transistor Q12 is determined by the decoded command word developed on the output of IC21-1. During the time Q12 is cut off the transmitter frequency is FM'd by a 1.95 kHz signal, representing a logic "0". When Q12 is turned on, the transmitter signal is modulated by a 2.6 kHz signal, representing a logic "1".

If a "high" is applied to IC9 pin 12 during the 16.4 ms scanning time of IC16, Q12 will subsequently conduct for 12.3 ms and be cut off for 4.1 ms. However, if a "low" is applied to IC9 pin 12 during the scanning sequence, Q12 will conduct for 4.1 ms and be cut off for 12.3 ms (see FO-4 and FO-8). Assume a "high" is applied to IC9 pin 12. Pin 13 will receive a high for 4.1 ms from IC8-2 and IC11-3 when the pulse from Q13 is "low". (The cycle time on Q14 is 16.4 ms.) During a total time of 12.3 ms, Q12 is conducting due to a "high" received from IC9-10. Simultaneously, IC10 is blocked by the "low" from IC9 pin 11.

If a "low" is applied to IC9 pin 12 during the scanning cycle, IC9 pin 11 goes "high". This "high" is applied to IC10 pin 5. IC10 pin 4 is "high" because IC16 is not reset. Q13 on IC12 is "low" at the same time as Q14 is "high", for only 4.1 ms. This means IC10 pins 2 and 3 are "high" for only 4.1 ms. With IC10's input all high, IC9 pin 10 goes "high" turning Q12 on for 4.1 ms. Q12 is then turned off for 12.3 ms.

Decade counter IC7 is clocked by IC12 at a 32 microsecond (31,250 Hz) rate. Consequently, a frequency of 5.2 kHz is found at output Q6, and 3.9 kHz on output Q8. When Q12 is conducting IC9-6, will go "high". When IC7 is in state Q6, pin 5 of IC9 will receive a "high". IC9-3 goes "high setting IC6-6, and IC7-15 is reset. As IC7 is reset, it resets IC6-4. At the same time, IC6-11 is clocked. Transistor Q11 is turned on and a pulse is developed and sent out B5. The next time IC7 reaches state Q6, IC6-6 is set again, IC7 is reset, and IC6-11 is clocked. This places IC6-11 in the reset condition, and Q11 is blocked. Q11 starts to conduct again when the next pulse arrives from IC7 pin 6. Because IC6-11 is set every other clock pulse Q11 is turned on and off at a 2.6 kHz rate (i.e., half of the 5.2 KHz clocking rate). When Q12 is cutoff, IC8-7 takes control of the frequency Shift Modulator from IC7, Q8. The output frequency is then 1.95 kHz. The output from IC8-12 is applied to the Modulator Amplifier in the High Frequency CCA, via J903 pin 6.

5-7. BLOCK DIAGRAM OPERATION OF RADIO RECEIVER (See FO-4.)

a. The radio receiver receives the FM command signals (143-165 MHz) transmitted by the OCD/transmitter and translates these signals into logic levels which are sent to the Electronic Control Unit as RAISE, LOWER or FIRE commands. The commands are used to raise or lower the target silhouette and actuate a visual hit indicator lamp (VHIL), or optional hostile fire simulator (HFS) and visual hit smoke scorer (VHSS).

b. The receiver consists of four circuit card assemblies (CCAs): a mother-board with output relays, a High Frequency (HF) CCA which receives the incoming signal and outputs an audio frequency signal, a detector CCA for the reconstruction of the signal messages, and a decoder CCA which checks the message and carries out the command by activating one of the output relays on the mother-board. When the receiver is plugged into the THM/TG target device, it receives supply voltage from the target device battery. The receiver is switched on when the FUNCTION switch on the Electronic Control Unit is set in the ON position. A voltage regulator on the High Frequency CCA supplies a regulated voltage to the HF CCA as well as to the detector and the decoder CCAs.

c. The HF CCA contains a double superheterodyne receiver with squelch circuitry and an economizer device, which eliminates current consumption in the standby mode. The low frequency (LF) signal from the HF CCA is converted on the detector CCA into a six digit message, exactly the same as the message sent by the transmitter by a flip-flop, which is alternately SET and RESET in time with the frequency shifts in the LF signal. The sequence on the detector is controlled by a clock pulse from a clock pulse generator. The sequence on the decoder CCA is controlled by pulses from the detector CCA. These pulses are produced in a pulse generator at different times after the leading edge of the decoded pulses.

d. On the decoder CCA, the digits 3-5 (receiver address) are compared with digits which are locally generated. The digits indicate the receiver number, which is determined by the combination of jumpers on the motherboard. If the numbers coincide, or if the digit or the receiver group is one, the function digits 1-2 become active and actuate one of the relays for FIRE, UP or DOWN. Time to detect a function is 545 ms. This includes the time it takes to lock the current message (115 ms) and the time for the two correct message (230 ms). This time can be reduced to 230 ms by disconnecting the current saving device, however, the standby current drain for the receiver is increased 13 ma to about 45 ma.

5-8. DETAILED OPERATION OF RECEIVER HIGH FREQUENCY CCA. (See FO-5).

a. Radio Frequency Stage. The signal from the antenna is fed through two tuned filter stages, U101 and U103, to preamplifier stage V101, which provides a gain of about 12 dB. The filter has a bandwidth of 15 MHz. The signal is then fed through a three-stage filter, U105, U107 and U109 which has a bandwidth of 4 MHz. These filters suppress the undesirable sidebands.

b. First Local Oscillator. The first local oscillator, V105, is a crystal controlled Colpitts oscillator. Filter U111 and U113 are tuned to the third harmonic of the oscillator. The output power to mixer V103 is 6 mw. The voltage level, after filter U111, is 1 to 1.5 VAC.

c. First Mixer. The amplified received signal is fed to one of the gates on MOS-field effect transistor V103, which makes up the first mixer. The first local oscillator signal is fed to the second gate. During the mixing action, an intermediate-frequency (IF) of 10.7 MHz is produced. This IF signal is used as the carrier for the DATA received from the transmitter.

d. First IF Amplifier. Channel separation is obtained in the crystal filter H201. The channel separation is 25 kHz. U201 is a low noise amplifier which amplifies the IF by 30 dB before it is fed to the second mixer. The second local oscillator is crystal controlled. Its output frequency is 10.245 MHz. This local oscillator signal is mixed with the IF signal in second mixer Z201, developing a new intermediate frequency of 455 kHz.

e. Discrimination and AF Amplifier. The discriminator is an asymmetric detector using U211 and diodes D205 and D207. The detector removes the 455 kHz carrier and isolates the DATA signal, which consists of 2.6 kHz or 1.59 kHz. The discriminator is followed by an emitter follower, V203, which matches the input impedance to voltage divider R237-R239. The AF amplifier has an active filter with a limiting frequency of 3 kHz. Signals below 1 kHz are limited by the capacitors C257 and C260. The detected DATA is sent out pin 5 to the Detector CCA.

f. Voltage Stabilizer. The voltage regulator is formed by series transistor V301 and controlled by the differential amplifiers, V303 and V305. The reference voltage of 5.6 volts is obtained from the zener diode DR303. The 10 VDC supply voltage is fed to V307 in the economizer circuit to supply the high frequency CCA with operating voltage. It is also sent out pin 3 to supply the Detector and Decoder CCAs. The battery input to the voltage stabilizer is provided at pin 1.

g. Economizer and Squelch Circuits. The economizer circuit is used to decrease the current drain on the battery when there is no carrier signal present. The economizer is controlled by the squelch circuit. When the ECONOMIZER switch is set to the ON position, a 10 VDC is applied to the squelch circuit, consisting of V315, V317, and V319. With no signal from the transmitter, noise is amplified by the receiver. This noise is fed into V203, through C267, to noise amplifier V315, which is now operating due to the closed ECONOMIZER switch. V315 is tuned to 10-20 kHz so that it will not respond to the normal carrier frequency. The noise is detected by V317, causing V319 to conduct. As V319 starts conducting, 13 to 45 ma of current flows through resistors R343 and R345. The voltage drop across R345 causes V313 to conduct. When V313 conducts, the multivibrator consisting of V309 and V311 changes states, thus lowering the conduction of V307. This decreases the output of V307 and in turn lowers the operating level of all circuits in the receiver. This will continue until a signal is received from the transmitter, causing the economizer to change states, once again allowing V307 to resume its normal conducting level.

5-9. DETAILED OPERATION OF DECODER CCA. (See FO-6.)

a. Six-Bit Shift Register. This register, IC2, converts serial data, i.e., the received message of the majority gate on the detector CCA, into parallel form. The input message is fed to a 6-bit shift register, which is clocked by P2 and reset by P7 after each message. When an interrupt is received at P9, the "high" fed through CR4 holds IC2 in the reset condition. The clock pulses received at P2 clocks the received message into the shift register. As the message is placed into the register, it SETs or RESETs the six outputs, thereby reconstructing the original transmitted message. IC2 pin 4 is Bit 1, pin 5 is Bit 2, pin 2 is Bit 3, pin 11 is Bit 4, pin 12 is Bit 5, and pin 13 is Bit 6.

b. Address Decoding. Address selection is accomplished by the EXCLUSIVE-OR gates IC1 and the NAND gates IC4. Bits 3, 4, 5 and 6 of the input message are set in the input register IC2. From there they are fed to IC1. IC1 also receives, as an input, the selected address for that particular receiver. IC1 must now compare the address found in the received message with the address set on the receiver. Setting the address on each receiver is accomplished by completing the connections on the mother-board at contacts 2, 3, and 4.

To explain the function of the address decoder, set the receivers address at 4. This means a jumper is inserted across A and B on the mother-board. In the received message, Bits 3 and 4 would be "high", and Bits 5 and 6 would be "low" (see FO-8). IC1 would have a "low" on pin 9 and a "high" (Bit 3) on pin 8. The output at pin 10 would be "high" reverse biasing CR2. IC1 has a "low" on pin 12 with a "high" (Bit 4) on pin 13. As a result, pin 11 goes "high" reverse biasing CR1. With both CR1 and CR2 reversed biased, a "high" is felt on IC4 pin 6. Now IC1 pin 6 is "high" and pin 5 (bit 5) is "low", causing IC1 pin 4 to go "high". A "high" is now applied to both pins 5 and 6 of IC4. Its output drops "low" and is fed to IC4 pin 1, causing IC4 pin 3 to go "high". If IC4 pin 3 is "high", the correct receiver address has been decoded.

It is possible to select all eight receivers on a given frequency channel by pressing the 1-8 pushbutton on the transmitter. When this is done, Bit 6 in the transmitted message is set. With Bit 6 set, it will override the addresses set into the individual receivers. This is accomplished as follows:

With receiver 1-8 selected on the transmitter, Bits 3 through 5 in the transmitted message will be "low" (see FO-7). Bit 6 is SET. In the receiver decoder card IC1 pin 2 (bit 6) will be "high". IC1 pin 1 is always "high". Two "highs" into IC1 cause IC1 pin 3 to go "low". This "low" overrides any input at IC4 pin 1. As a result IC4 pin 3 must go "high", meaning the receiver address has been decoded.

c. Function Selection. The function select circuits are divided into three separate channels. One for raising the target, one for lowering the target, and one for the firing function. Bits 1 and 2 of the received message

define which function is to be performed (see FO-8). As an example, if the FIRE function is selected, Bits 1 and 2 are both SET. This means that IC2 pins 4 and 5 are "high". The "high" on IC2 pin 4 is fed to IC3 pin 5 and IC3 pin 1. The "high" on IC2 pin 5 is fed to IC3 pin 4 and IC3 pin 12. With the correct address decoded, IC4 pin 3 is "high" and is fed to IC3 pins 1, 13, and 3. IC3 pin 6 goes "low". The "low" at IC3 pin 6 is fed to the data (pin 9) terminal of IC8 in the FIRE channel. It is also fed to IC3 pins 11 and 8, causing those gates to go "high" on their outputs. If the output of IC3 is "high", the channel it feeds is inactive, meaning it will not produce its function (i.e., RAISE, LOWER, or FIRE).

CR6 and C3 form a power ON set circuit to set all the flip-flops at power ON. The flip-flops have their clock terminals tied to inverter IC9 pin 6. IC9 pin 7 receives a "high" input from P5, which goes "high" at the end of each message. IC9 pin 6 goes "low" clocking all six flip-flops. Since IC3 pin 6 is low, the Q of the first flip-flop in the FIRE channel goes "low". The Q of the second flip-flop is still "high". It is inverted to a "low" by IC9 and holds Q3 cut-off. As the second end of message pulse (P5) is received, the flip-flops are clocked again. This time the second flip-flop Q terminal is driven low. IC9 pin 2 inverts the "low" to a "high", causing Q3 to saturate, energizing the FIRE relay. The receiver must receive two messages, that are the same, to set the output on the second flip-flop to "low".

The other two channels (i.e., RAISE and LOWER) are inactive because IC3 pins 9 and 10 are "high". The "high" on IC3 pin 9 is fed to IC5 pin 9. When an end of the message pulse is received, IC5 pin 8 goes "high" causing IC5 pin 10 to go "low". IC5 pin 11 is "high" for the duration of the end of the message pulse and then drops "low" again. This action sets the IC6 flip-flops. Therefore, Q1 and Q2 remain cut-off and the RAISE and LOWER relays remain de-energized. If an interruption message is received, IC9 pin 10 will go "low" forward biasing CR5 causing IC5 pins 11 and 4 and IC4 pin 10 to go "high" for the duration of the interrupt message. This sets all the flip-flops de-energizing the RAISE, LOWER and FIRE relays.

5-10. DETAILED OPERATION OF THE DETECTOR CCA. (See FO-7 and 8.)

a. Comparator Circuit. The incoming demodulated signal is applied to the operational amplifier IC1. IC1 converts the demodulated signal into a square wave and applies it to Q1. Q1 produces a positive 2 microsecond pulse on the trailing edge of each cycle of the input square wave.

b. Period Time Metering. The pulses from Q1 are fed to the reset terminals on the counters IC3 and IC2. IC3, a binary counter, is clocked by the 1 MHz clock pulse produced by the clock pulse generator. In turn, IC2 is clocked by IC3 every 64 microseconds. If the output from Q1 is at a frequency of 2.6 kHz (i.e., a logic "1"), IC2 will only reach state 6 before it is reset to zero. However, if the output from Q1 is at a frequency of 1.95 kHz, (i.e., a logic "0"), IC2 will be allowed to reach state 8 before being reset.

c. Five-Bit Shift Register. Each five bit register is comprised of one IC5 and one IC4. If the frequency of the detected input signal is 2.6 kHz, IC2 state 6 will fill one 5-bit register IC5 with ones. IC5 is clocked each time IC2 is reset to zero. If on the other hand the input signal is at a frequency of 1.95 kHz, then IC2 state 8 will fill the other 5-bit register with ones. As either IC5 is filled with ones, its output states Q0 through Q3 will be "high". IC4 furnishes the fifth bit.

d. Majority Gate and Digital Filter. The pulses from the shift registers are sent to majority gates IC6, which then sends out a "low" if at least three inputs out of five are "high". A "low" on IC6 pin 2 indicates that a 2.6 KHz signal has been detected. This "low" causes IC8 pin 11 to go "high". This "high" is fed to IC8 pin 9. IC8 pin 8 is already "high" because the detected input signal is not 1.95 kHz. IC8 pin 10 goes "low",latching IC8 pin 11 "high". If the detected input signals had been 1.95 kHz in frequency, IC8 pin 11 would be latched "low". The output at detector CCA pin 5 is sent to the decoder CCA (see FO-7).

e. Pulse Generator. On the leading edges of the decoded FS-modulation sent out CCA pin 5, a "low" is fed through C10 and CR2 to IC8 pins 1 and 2. IC8 pin 3 goes "high" resetting IC7 and IC9. The binary counter IC7 is clocked by the clock pulse generator; IC7, in turn, clocks decode counter IC9. Two milliseconds after IC9 is reset the clock at P2 is generated. During the duration of the message, IC9 never counts further than Q2. In the pause between messages, IC9 is allowed to count to P5 and P7 generating an "end of message" and a "start bit reset" pulse, respectively. If an interrupt message is sent, IC9 counts to P9. At P9, IC9 stops because the "low" on the E-terminal disappears. IC9 will remain stopped until reset. These pulses, P2, P5, P7, and P9 are used in the decoder CCA.

5-11. DETAILED OPERATION OF MOTHER-BOARD. (See FO-9.)

The main function of the mother-board is to transfer the connections between the various circuit cards. The receiver number is selected by jumpers inserted on the mother-board and determined by the combination A + B + C + 1.

5-12. OPERATION OF THM/TG.

Refer to paragraphs 5-14 through 5-18 for a description of the operation of the power supply, Electronic Control Unit, target raise/lower mechanism, and hydraulic system of the THM/TG. In the following discussions, a logic "high" refers to a pulse having a level of +5 V, +12 V; a logic "low" refers to ground level or 0 V.

5-13. OPERATION OF THE POWER SUPPLY. (See FO-10.)

DC power for operation of the THM/TG is provided by a 12-volt lead-acid battery. With the Electronic Control Unit FUNCTION switch in any position other than O, the battery voltage is applied through S2A to pin 6 of the battery check circuit card assembly (CCA), and to connectors ST1 and ST2.

Diode CR1 and capacitor C1 reduce voltage drop in conjunction with current surge. This voltage is applied through a second section (1-2) of S2A to the TEST switch, coils of the various relays, pin Z of the logic CCA, and through P2-D to the radio receiver. The battery voltage is also dropped by resistor R6 and applied to pin S of the amplifier CCA and to the SENSITIVITY switch. With the FUNCTION switch in position O, C1 is discharged through resistor R5 and S2B to ground.

5-14. BLOCK DIAGRAM OPERATION OF ELECTRONIC CONTROL UNIT. (See FO-11.)

The Electronic Control Unit contains three printed circuit card assemblies; an amplifier CCA, a logic CCA, and a battery check CCA. The amplifier CCA recieves hit pulses from up to four separate hit sensors. The signals are amplified and compared with a threshold signal from the SENSITIVITY selector. If the amplitude of the hit pulse is of sufficient amplitude, a hit signal is sent to the logic CCA. The logic CCA collects and processes information from the amplifier's hit circuits, the limit switches, the FUNCTION switch, and the receiver or Target Interface Unit (TIU). Six relays, energized by the logic CCA, are used to operate the target raise and lower mechanism, the visual hit smoke scorer (VHSS), the hostile fire simulator (HFS), and the Lamp Assembly (LA).

a. Connectors. The Electronic Control Unit uses the following connectors:

(1) ST1 and ST2 are 10-pin receptacles for connecting the Target Interface Unit (TIU) and hostile fire simulator, respectively.

(2) ST3 is a 5-pin receptacle for connecting the Lamp Assembly.

(3) ST5 through ST8 are 7-pin receptacles for connecting the hit sensors.

b. Setting Hit Sensitivity. Hit sensitivity is adjusted to suit the ammunition being used. This is accomplished by means of the SENSITIVITY switch and inputs N and S on the amplifier CCA.

c. Fault Circuit. To avoid malfunction from a defective sensor, a fault circuit has been incorporated into the amplifier. If the sensor is connected to the Electronic Control Unit and is intact, the target operates normally. If a short-circuit or circuit break has occurred in any of the hit sensors due to damage from projectiles, a fault signal is generated on the amplifier CCA. This signal, applied to pin V of the logic CCA, causes the target to lower automatically. The target cannot be raised until the defective sensor is disconnected from the Electronic Control Unit.

d. Scoring. The THM/TG uses various options for indicating hits. The various options are selected by the FUNCTION switch as indicated in (1) through (7). Figure 5-1 gives a cross-reference between FUNCTION switch position and the symbol on the panel.

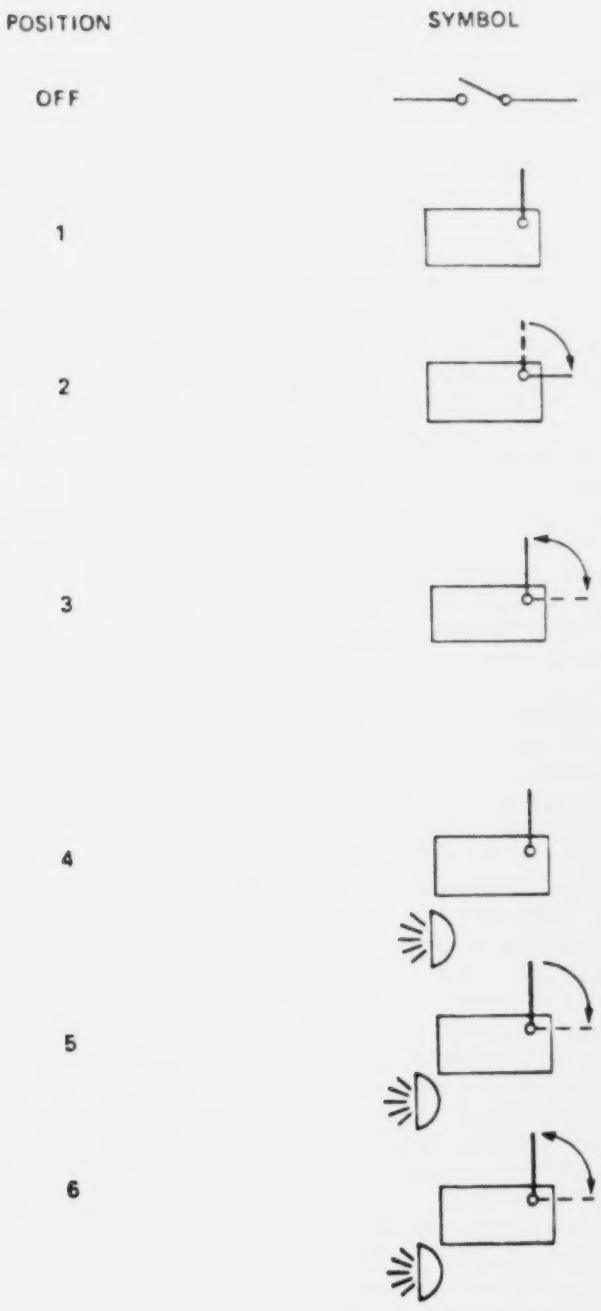


Figure 5-1. THM/TG Device Function Switch Position Versus Symbol

(1) General. When a projectile strikes the target, a signal is generated in the hit sensor. This signal is amplified on the amplifier CCA and compared with a reference voltage applied between inputs N and S of the amplifier. The reference voltage is adjustable so that the hit sensitivity may be adapted to suit the ammunition being used. If the amplitude of the hit signal is of sufficient magnitude, a hit signal generated at output pin B is applied to pin X of the logic CCA. The hit sensors are connected to HIT SENSOR connectors ST5, ST6, ST7, and ST8 on the Electronic Control Unit.

(2) FUNCTION Switch in Position 1. With the FUNCTION switch in position 1, the TKS, through the TIU, is actuated and the target board remains upright until a "target down" command is received from the transmitter. A counter pulse of 25 ms, 10-12V amplitude is supplied to pin G in connectors ST1 and ST2 for future connection of an optional electro-mechanical counter. A counter pulse of 3 ms, 15 V amplitude is available at output pin U for future connection of an electronic counter. The hit signal, which is generated when a projectile strikes the target, activates the logic circuits, resulting in a signal at output B of the logic CCA, energizing relay K1. When the relay is energized, contacts 9 and 10, and 6 and 7 close shorting pins M and N of ST1. This allows the FIRE strobe pulse from the TIU to go out to the TKS.

(3) FUNCTION Switch in Position 2. With the FUNCTION switch in position 2, counter pulses are generated as in position 1; the TKS, through the TIU, is activated; and the target is automatically lowered and remains in the down position until a "target up" command is received. Relay K1 is activated by a 12-volt logic level from pin B of the logic CCA as described in position 1. In position 2, however, pin S of the logic CCA is returned to ground through S2B. If the target is in the raised position, logic levels will be generated at outputs R and N of the logic CCA. The logic level at output N of the logic CCA energizes relay K3. When K3 is energized, the pump motor starting relay is energized (via the battery check circuit) and the battery voltage is delivered to the pump motor in the hydraulic motor and valve unit. When the pump motor is started, oil is sucked through the filter in the oil container and flows from the pump pressure side through the down solenoid valve, to the lowering side of the cylinder. The operating cylinder piston rod moves inward and the target is lowered. Just before the target reaches the down position, limit switch S1 for the lowered position opens. This generates a stop pulse to the lowering logic and relay K3 is de-energized. In conjunction with this, the pump motor start relay is de-energized and the battery voltage to the motor is removed. In order to ensure

that a raising operation does not occur during the retardation time of the pump motor, relay K2 is provided with a delay circuit of 2-3 seconds. The delay circuit prevents the relay from de-energizing and causing the solenoid valve to change state before the pump motor has stopped. If the limit switch does not stop the motor, a time circuit on the logic CCA generates a stop pulse to the lowering logic, and relay K3 is de-energized 10-12 seconds after the lowering command has been received.

(4) FUNCTION Switch in Position 3. With the FUNCTION switch in position 3, counter pulses are generated as in position 1; the TKS is activated; and the target automatically lowers; then raises after approximately 10-12 seconds. The TKS is activated by a logic level from output B of the logic CCA as described for position 1. In position 3, however, output L of the logic CCA is returned to ground through S2B. If the target is in the raised position, logic levels will be generated at outputs R and N of the logic CCA and the target will be lowered as described for position 2. At the same time, a timing circuit on the logic CCA is activated and a "raising" pulse is generated approximately 10-12 seconds after the lowering operation. The resulting logic level at output M causes an output from output 3 of the battery check CCA, energizing relay K6 for the up solenoid valve. Relay K3 is again energized. When relay K3 is energized, the pump motor-starting-relay is energized and the battery voltage is delivered to the pump motor in the hydraulic motor and valve unit. When the pump motor is started, oil is sucked through the filter in the oil reservoir and flows from the pump pressure side through the up solenoid valve to the raising side of the cylinder. The operating cylinder piston rod moves outward, the target arms are turned 85 degrees, and the target is raised. Approximately 5 degrees before the limit position, limit switch S2 closes for a raised target. This generates a stop pulse to the raising logic and relay K3 is de-energized. In conjunction to this, the pump motor stop relay is de-energized and the motor stops. If the limit switch does not open before the limit position is reached, a timing circuit on the logic CCA generates a stop pulse to the raising logic, and relay K3 is de-energized 10-12 seconds after the raise command has been received. When the motor has stopped, oil is prevented from flowing back to the oil container by a check valve located in the hydraulic motor and valve unit. The hydraulic motor and valve unit also contains a pressure limiting valve. This valve releases excess pressure in the return line if the pressure should become excessive.

(5) FUNCTION Switch to Position 4. With the FUNCTION switch in position 4, counter pulses are generated as in position 1; the TKS is activated; the target remains upright until a "target

down" command is received from the OCD/transmitter; and the Lamp Assembly is illuminated. Activation of the Lamp Assembly is as described for position 1. In position 4, the signal from output B of the logic CCA also energizes relay K5 via S2C and diode CR8. When K5 is energized, 12V is applied to the Lamp Assembly via pins A and B of ST3 and the Lamp Assembly is illuminated.

(6) FUNCTION Switch in Position 5. With the FUNCTION switch in position 5, counter pulses are generated as in position 1; the TKS is actuated; the target automatically lowers and remains down until a "target up" command is received from the OCD/transmitter; and the Lamp Assembly is illuminated. Actuation of the VHSS and the lowering of the target is as described for position 2. In position 5, the signal from output B of the logic CCA also energizes relay K5 via S2C and diode CR8. When the relay is energized, a 12V current is applied to the Lamp Assembly via pins A and B of ST3 and the Lamp Assembly is illuminated.

(7) FUNCTION switch in Position 6. With the FUNCTION switch in position 6, counter pulses are generated as position 1. Also, the TKS is actuated, the target automatically lowers; then begins to raise after approximately 10-12 seconds and the Lamp Assembly is illuminated. Actuation of the TKS and the lowering and raising of the target is as described for position 2. In position 6, the signal from output B of the logic CCA also energizes relay K5 via S2C and diode CR8. When the really is energized, a 12V current is applied to the Lamp Assembly via pins A and B of ST3 and the Lamp Assembly is illuminated.

e. Remote Raising and Lowering of Target. The THM/TG can be remotely controlled by either the OCD/transmitter or the RETS Range Control Station.

(1) OCD/Transmitter. The OCD/transmitter transmits raise/lower commands, which allow remote raising or lowering of the target. If an "up" command push-button on the OCD has been pressed for the related frequency group and channel, the receiver will decode the command and provide it to input E of the logic CCA, via P1-D, as a 12V logic level. This results in 12V logic levels being generated at pins M and N of the logic CCA. The logic Level at output M causes an output from pin 3 of the battery check CCA, which energized relay K6 for the up solenoid valve. The logic level at output N of the logic CCA energizes relay K3. When K3 is energized, the pump motor starting relay is also energized and the battey voltage is delivered to the pump motor in the hydraulic motor valve unit. The target will now raise as described in paragraph 5-16b. If a DOWN command pushbutton on the OCD has been pressed for the related frequency group and channel, the receiver

will decode the command and provide it to input K of the logic CCA, via P1-F, as a logic level. This results in 12V logic levels being generated at outputs R and N of the logic CCA. The logic level at output R results in an output of the battery check CCA, which energizes relay K2 for the down solenoid valve. The 12V logic level at output N of the logic CCA energizes relay K3. When K3 is energized, the pump motor starting relay is also energized and the battery voltage is delivered to the pump motor in the hydraulic motor and valve assembly. The target will now lower as described in paragraph 5-16c. The decoded raise and lower commands from the receiver are also routed to pins ST1 and ST2.

(2) Range Control Station. When the THM/TG is integrated into the RETS system, it is connected to the Target Interface Unit by a W107 cable. The cable connects to the ST1 jack on the Electronic Control Unit. A second connector is placed between J3 and P3 on the back of the electronic unit. ST1 receives inputs from the TIU on the following pins: ST1 pin D receives the UP pulse, pin E receives the FIRE pulse, pin F receives the DOWN pulse and pin G sends the HIT pulse to the TIU, pin K receives 12 VDC and pin M receives the Fire Strobe pulse which then goes out pin N to Fire the TKS.

If an UP command is sent by the RCS, a "high" logic level of 12 VDC is sent into ST1 pin D. This results in a "high" at pins M and N of the logic CCA. The "high" at M causes an output from pin 3 of the battery CCA, which in turn energizes relay K6 for the UP solenoid valve.

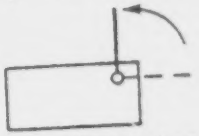
The "high" at pin N of the logic CCA energizes relay K3. When K3 is energized, the pump motor start relay is also energized and the battery voltage is delivered to the pump motor in the hydraulic motor valve unit. The target will then raise as described in paragraph 5-16b.

f. Remote Firing of Hostile Fire Simulator.

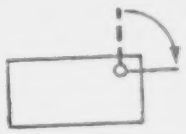
(1) Transmitter Controlled. Remote firing of an optional Target Kill Simulator (TKS) connected to ST2 is initiated by pressing the appropriate FIRE button on the OCD/transmitter. The decoded Fire Command from the receiver energizes relay K4 and is also applied to pin E of ST2. When the relay is energized, a closed connection is placed across pins M and N of ST2 by K4 contacts 6-7 and 9-10, thereby activating the TKS.

(2) RCS Controlled. The TKS is activated by a Fire Strobe pulse sent from the RCS to the TIU which then sends a Fire Command to the THM/TG connector ST1 pin M. When a Hit Pulse is generated at the Logic CCA pin B, it energizes the K1 relay. This closes contact 6-7 and 9-10 of relay K1 allowing the Fire Command to be sent out ST1 pin N. From here the command is routed through the TIU to the TKS.

g. Local Testing of Target and Lamp Assembly Operation. TEST Switch S1 on the electronic unit is used for testing equipment operating as follows:



(1) Test Switch in Raising Position. When the TEST switch is momentarily held in this raising position, the logic circuits for the raising function are activated by a 12V current applied to input E of the logic CCA, via contacts 5-6 of S1. This results in 12V logic levels being generated at outputs M and N of the logic CCA. The logic level at output M causes a 12 V logic level from output 3 of the battery check CCA, which energizes relay K6 for the UP solenoid valve. The logic level at output N of the logic CCA energizes relay K3. When K3 is energized, the pump motor starting relay is also energized and the battery voltage is delivered to the pump motor in the hydraulic motor and valve unit. The target will raise as described in paragraph 5-16b. With the TEST switch momentarily held in the raised position, relay K5 is also energized by a 12V current provided via contacts 2-3 of S1. When the relay is energized, 12 volts is applied to the Lamp Assembly via pins A and B of ST3 and the Lamp Assembly is illluminated for 2-3 seconds.



(2) TEST Switch in Lowering Position. When the TEST switch is momentarily held in the lowering posititon, the logic circuits for the lowering function are activated by 12 volts applied to input K of the logic CCA via contact 5-4 of S1. This results in 12V logic levels being generated at outputs R and N of the logic CCA. The logic level at output R results in a 12V logic level at output 1 of the battery check CCA, which energizes relay K2 for the down solenoid valve. The logic level at output N of the logic CCA energizes relay K3. When K3 is energized, the pump motor starting relay is also energized and the battery voltage is delivered to the pump motor in the hydraulic motor and valve unit. The target will lower as described in paragraph 5-16c.

h. Battery Check Circuit. The battery check circuit lights the front panel BATTERY light emitting diode (LED) continuously, during target raising or lowering, if the battery voltage is greater than 10.5 V. If the battery voltage drops below approximately 10.5 V, the battery check circuit causes the front panel BATTERY LED to flash.

5-15. DETAILED OPERATION OF THE ELECTRONIC CONTROL UNIT AMPLIFIER CCA. (See FO-12.)

a. Hit Amplification. The amplifier CCA contains four separate amplifier stages - one for each of the four hit sensors. The hit pulse (5 to 12 V, 1 to 10 ms) is applied to an amplifier stage where it is amplified by IC2. The amplified hit pulse is fed from IC2 to limiter CR3 and CR8; from

there it is sent to differential amplifier IC3. In IC3 the hit pulse is compared with a threshold voltage produced by the setting of the SENSITIVITY Switch. If the hit pulse amplitude does not exceed the threshold, the hit pulse is not felt on the output of IC3. If, however, the hit pulse exceeds the threshold voltage, a 15 ms hit pulse is generated on the output of IC3. This hit pulse is then fed to pin X on the logic CCA.

b. Hit Sensor Fault Circuit. A fault circuit is incorporated in the amplifier to detect defective hit sensors. If the hit sensor is connected to the Electronic Control Unit and it is intact, the target mechanism functions normally. If the sensor is connected but the cable is defective (short or open), the target is lowered automatically and remains DOWN until the defective hit sensor is disconnected from the Electronic Control Unit.

This is accomplished by a comparator circuit, which consists of IC5 for hit sensors 1 and 2, and IC4 for hit sensors 3 and 4. IC5 receives a bias on pins 5 and 6. Pin 5 sets the upper threshold and pin 6 sets the lower threshold. A DC level on pins 4 and 7 of IC5 is developed by a voltage divider consisting of R24, R15, L1, and the hit sensor. If the hit sensor cable is shorted, the voltage level at the junction of R15 and L1 goes low. This "low" is felt on pin 7 of IC5. The low on pin 7 drops below the bias on pin 6 and IC5 conducts. IC5's low output is sent to pin D. Pins D and P are tied together inside the hit sensor connector (if the hit sensor is not connected, pins D and P are open and the fault circuit is not operational). Therefore the "low" from IC5 is fed to pin R on the amplifier CCA. From pin R, the "low" output is sent to the logic CCA pin V. The logic CCA then generates a DOWN command. If the hit sensor cable is open, the voltage level at the junction of R15 and L1 goes "high". This "high" is felt on pin 4 of IC5. The "high" exceeds the bias on pin 5 and IC5 conducts. Its output drops "low" at pin 2, and this "low" is sent to pin R generating a target DOWN command in the logic CCA as described above.

5-16. DETAILED OPERATION OF THM/TG ELECTRONIC CONTROL UNIT LOGIC CCA. (See FO-13.)

a. TKS and Lamp Assembly Signal Generation.

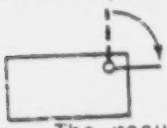
(1) When the hit signal enters input pin X, Q3 conducts causing IC4 pin 4 to go "high". IC8 pin 1 is "high" and pin 2 is "high" if the target is within the Sensitivity Zone controlled by Sensitivity Switch S3. If the target is outside the Sensitivity Zone (i.e., approximately 65^{0} to 75^{0} from the UP position), a ground is applied to pin 4 of the logic CCA. This pulls the 8 VDC on R63 "low"; this "low" is fed to IC8 pin 2 which blocks the HIT signal. With IC8 pin 2 "high", IC8 pin 3 goes "low" when the hit pulse is received. IC8 pin 4 goes "high" setting IC9 and its Q terminal "high", causing Q2 and Q1 to conduct. Pin Y goes "high". This output is used as the hit signal sent to the Range Control Station.

At the same time, flip-flop IC9 pin 8 receives a set signal from the Q terminal of IC9 pin 2. This causes IC9 pin 12 to go "low" holding IC9 pin 6 SET. With IC9 pin 8 set, pin 13 is "high", causing Q6 and Q5 to conduct. Logic card pin U goes "high". This output is not used at present. The duration of the pulses at outputs Y and U is determined by the rate at which the two flip-flops (IC9) are clocked. IC11 forms a clock pulse generator which runs continuously. The signal at the Q output (pin 12) of IC9 also resets binary counter IC11 via NAND gate IC3 pin 10. IC11 is clocked at pin 10 by Clock pulse generator IC10, which runs continuously, with a period of approximately 325 microseconds. When the counter reaches state Q5, after 5.2 ms, a positive pulse is generated. This pulse clocks flip-flop IC9 via pin 11 and the pulse length on output pin U thus becomes 5.2 milliseconds. When the counter reaches state Q8, after 41.6 ms, a positive pulse is generated. This pulse clocks flip-flop IC9, via pin 3, causing IC9 to go RESET. The Q terminal pin 1 goes "low", cutting off transistors Q1 and Q2. As a result, IC9 is conditioned to respond to the next hit pulse, and the output at pin Y is 41.6 milliseconds in length.

(2) When the hit signal enters pin X, flip-flop IC6 receives a set signal from the Q output (pin 13) of IC9. When flip-flop IC6 has been set, the output at B is switched to 12 V via NAND gate IC3 and transistors Q21-Q22. At the same time, decode counter IC7 counts, and after approximately 1.3 seconds, flip-flop IC6 is clocked by IC7 pin 2. This causes the B output to go to 0 volts, thereby turning off the Lamp Assembly and/or TKS (depending on the setting of the FUNCTION switch).

b. Target Lower/Raise Circuits. The target can be lowered or raised by the local TEST switch or remotely. The target will lower automatically when a hit occurs if the FUNCTION switch is in position 2 or 5, and lower then raise automatically when a hit occurs if the FUNCTION switch is in position 3 or 6. These operations are discussed in (1) through (4) below:

(1) Target Lowering from TEST Switch or Remote Command. Enabling of the relays associated with lowering the target is provided by transistor stages Q9-Q12. When the TEST switch is held in the down position, or if the appropriate command is received, input K of the logic CCA receives a 12 V input.



This voltage, via R41 and CR15, turns on transistor Q11, resulting in transistor Q12 turning off and transistors Q9 and Q10 turning on. The resultant signal at the collectors of Q9 and Q10 is fed, via diode CR32, to output pin r for energizing the DOWN relay. It is also applied to diode CR17; then to output pin N. These signals initiate lowering of the target.

(2) Automatic Lowering of Target. With the FUNCTION switch in position 2 or 5, input pin S is shorted to ground through the switch. IC1 pin 11 goes "high", enabling NAND gate IC1-3. When a hit is detected, pin 2 of IC1-3 receives a "high" pulse from the Q output (pin 13) of flip-flop IC9. This results in a "low" pulse at IC1-3 which is inverted to a "high" by IC1-10 and fed, via resistor R39, to the base of transistor Q11. This results in a "low" pulse at output pins R and N as described in (1) above.

(3) Target Raising from TEST Switch or Remote Command. Enabling of the relays associated with raising the target is provided by transistor stages Q12-Q16. When the TEST switch is held

in the UP position or if the appropriate UP command is received, input E of the logic board receives a 12 V input. This voltage, via R57 and CR23, turns on transistor Q15, resulting in transistor Q16 turning off and Q13 and Q14 turning on. The resultant signal at the collectors of Q13 and Q14 is fed to output pin M (UP valve relay) and, via diode CR16, to output pin N. These signals initiate raising of the target.

(4) Automatic Lowering and Raising of Target. With the FUNCTION switch in position 3 or 6, input pin L is shorted to ground through the switch. When the hit pulse enters input X on the logic board, a pulse is applied to the lowering logic, via NAND gate IC1-3, as described in (2) above. At the same time, decode counter IC7 begins to count and, after approximately 10 seconds, flip-flop IC4-Pin 3 goes "low" and a raising pulse is applied from IC2 pin 10 to the raising logic. The target is then raised.

c. Motor Stop Triggering Circuit. If the target arm is prevented from reaching the limit position during lowering or raising, decode counter IC7 receives a reset signal from the raising or lowering logic through IC3 pin 9. IC7 begins to count and approximately 12 seconds later pin 11 goes "high". The "high" output from IC7 pin 11 is applied to the raising and lowering logic, and the circuit which has not received a limit switch cutoff signal is cutoff. This removes the output of pin N and R, or pin N and M, and the motor starting relay and solenoid valve relay de-energize.

d. Hit Sensor Fault Circuit. If a short circuit or an open circuit has occurred in the hit sensor due to damage, the voltage level at pin V is pulled "low". This low voltage level forward biases CR37 and the target arm moves DOWN. At the same time, CR38 is forward biased, holding Q13 and Q14 in a cutoff state and preventing the target arm from being moved to the UP position. The target arm will remain DOWN until the defective hit sensor is disconnected from the Electronic Control Unit.

e. Sensitivity Zone. A prerequisite for the Electronic Control Unit to respond to hits is that the target is within the hit sensitivity zone. This angle can be adjusted and is sensed by proximity switch S3, producing a 10 V "high" at input pin J when the target is within the hit sensitivity zone. This "high" input conditions IC8-3 to respond to a hit pulse at pin X. If the target is not within the hit sensitivity zone (65 -75 from the raised position), a low will be sent to input pin J. The "low" is fed to IC8 pin 2, driving IC8-3 "high". This prevents a hit pulse from setting IC9.

5-17. DETAILED OPERATION OF THE BATTERY CHECK CCA. (See FO-14.)

a. Undervoltage Indicator. The circuit comprising IC1 and Q1 make up an undervoltage indicator, which causes the front panel BATTERY LAMP CR7 to illuminate continuously or flash as the target is raised or lowered. A voltage comparator, IC1, senses the voltage level of the battery at input 6, through resistor R6, and a 6.2 V zener diode, CR2. As long as the battery voltage exceeds 10.5 V under load, Q1 will conduct and illuminate CR7 continuously during the time the target is raised or lowered. If the battery voltage drops below 10.5 V, IC1 causes Q1 to cut off and on causing CR7 to flash during raising and lowering of the target.

b. Up Command. When a "low" 8-second pulse is applied to pin 4, IC1 pin 7 goes "high" causing Q2 to conduct. As Q2 conducts, it energizes K6 (the UP valve relay). After the input at pin 4 goes back "high", transistor Q2 is held in its conducting state for an additional 2 to 3 seconds due to the charge on C6. Therefore, the relay K6 will remain energized for approximately 10 to 12 seconds.

c. Down Command. When a "low" 8-second pulse is applied to pin 2, IC1 pin 1 goes "high", causing Q3 to conduct. As Q3 conducts, it energizes K2 (the DOWN valve relay). After the input at pin 2 goes back "high", transistor Q3 is held in the conductive state for an additional 2 to 3 seconds due to the charge on C5. Therefore, relay K2 will remain energized for approximately 10 to 12 seconds.

5-18. DETAILED OPERATION OF THE ELECTRO-HYDRAULIC SYSTEM. (See Figure 5-2.)

a. Hydraulic Motor and Valve Unit. The target UP and DOWN mechanism, comprised of the hydraulic motor and valve unit, and the hydraulic cylinder, is an electrically powered, hydraulically operated device which raises or lowers the target when activated by the logic CCA in response to UP and DOWN commands. A double action hydraulic cylinder provides force to raise the target. The hydraulic cylinder is provided with maintenance free bearings. Hydraulic hoses carry fluid between the motor and valve unit, and the hydraulic cylinder.

b. Up Hydraulic Operation. When an UP command is issued to the THM/TG, the logic CCA energizes K6 (the UP valve relay). When K6 energizes it applies a ground to the solenoid valve in the motor/pump unit. At the same

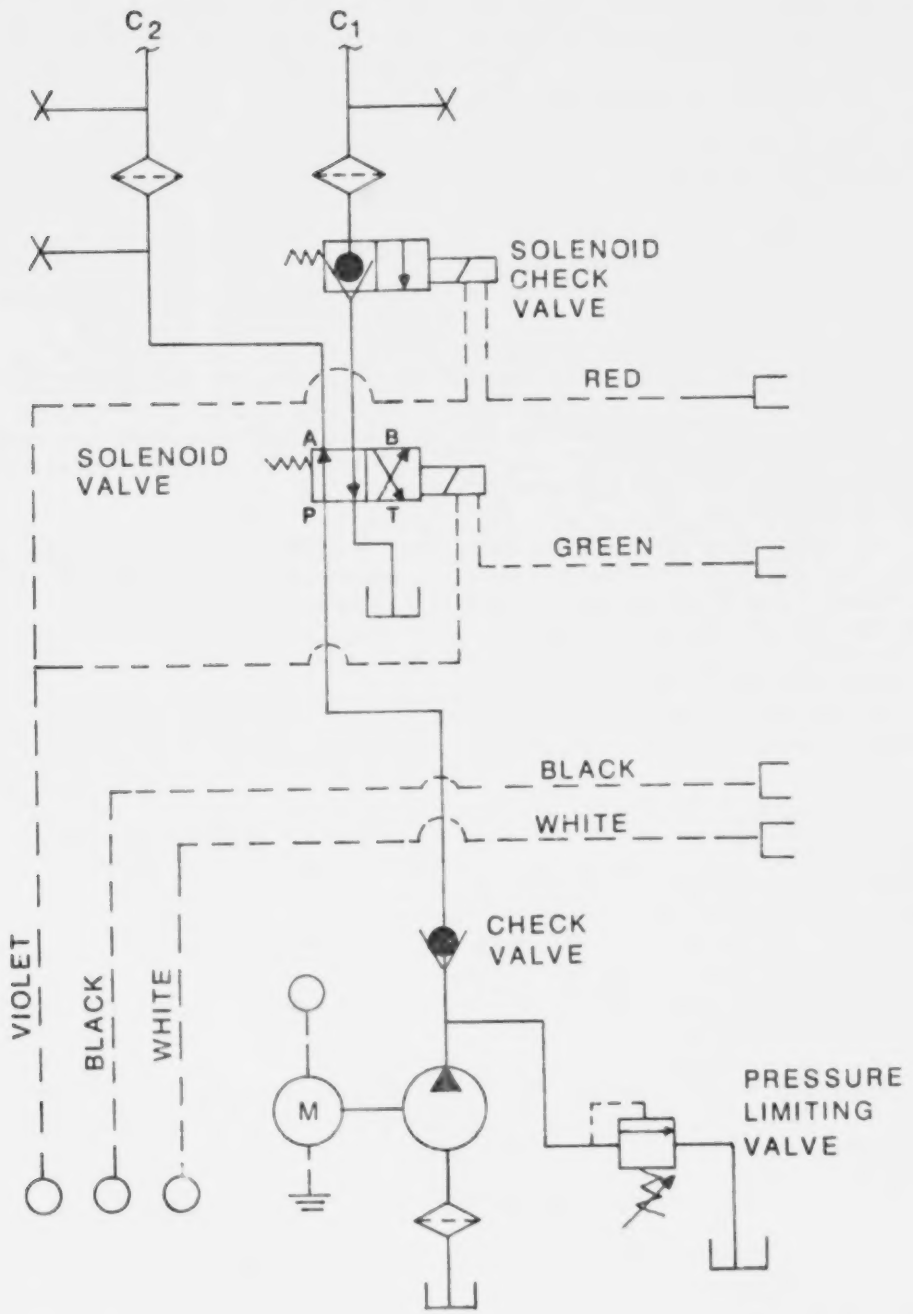


Figure 5-2. THM/TG Electro-Hydraulic Raise Lower Mechanism, Schematic Diagram

time, the logic CCA also energizes K3 and the motor relay, in turn energizing the motor start solenoid. The motor start solenoid delivers 12 V to the motor/pump unit and hydraulic system. On the output of the pump, there is a pressure limiting valve. This limiting valve controls the in-line pressure and is externally adjusted for 2300 psi.

The hydraulic fluid flows through the check valve assembly and is then applied to the solenoid valve. The solenoid valve is energized for an UP function and the fluid is pumped from port P to port B. The fluid is then applied to output port C1 and begins to fill the UP port in the hydraulic cylinder. As the UP port begins to fill, fluid is forced out of the C2 port on the cylinder. The fluid is forced back through the solenoid valve and into the reservoir.

When the target arm reaches the UP position, relays K3 and K6 in the Electronic Control Unit are de-energized. This stops the motor/pump unit and de-energizes the solenoid valve. The solenoid check valve on the output of the pump blocks the hydraulic line and prevents the hydraulic fluid from bleeding back out of the hydraulic cylinder.

c. Down Hydraulic Operation. When a DOWN command is issued to the THM/TG, the logic CCA in the Electronic Control Unit energizes K2, the DOWN valve relay. As K2 energizes, it applies a ground to the solenoid check valve inside the motor/pump unit. At the same time, the logic CCA energizes K3 (the motor relay), in turn energizing the motor start solenoid. With the motor start solenoid energized, a 12V current is applied to the motor/pump unit and fluid is pumped from the reservoir into the hydraulic system. The system pressure is controlled by the pressure limiting valve, which regulates at 2300 psi.

The hydraulic fluid flows through the check-valve and is sent to the solenoid valve. The solenoid valve is de-energized for a DOWN function so that the fluid is routed from port P to A, and then sent to C2 on the hydraulic cylinder valve. From C2, the hydraulic fluid begins to fill the DOWN port on the hydraulic cylinder. As the DOWN port fills, hydraulic fluid is forced out of port C1 on the cylinder. This fluid is sent back through the energized solenoid check valve, to port B to T, on the solenoid valve and into the reservoir.

When the target arm reaches the DOWN position, relays K2 and K3 are de-energized. The pump stops; the check-valve blocks the output port C2 and prevents hydraulic fluid from bleeding off the cylinder.

5-19. DETAILED OPERATION OF THE BATTERY CHARGER. (See figure 5-3.)

The Time Switch, with 115 VAC applied, provides 14 hours of programmed charge time. With the Time Switch in the ON position, a 115 VAC is applied to the step-down transformer, T1. T1 steps the input voltage down to 30 VAC and feeds it to the POWER lamp, L1. L1 illuminates indicating correct operation of the power circuits.

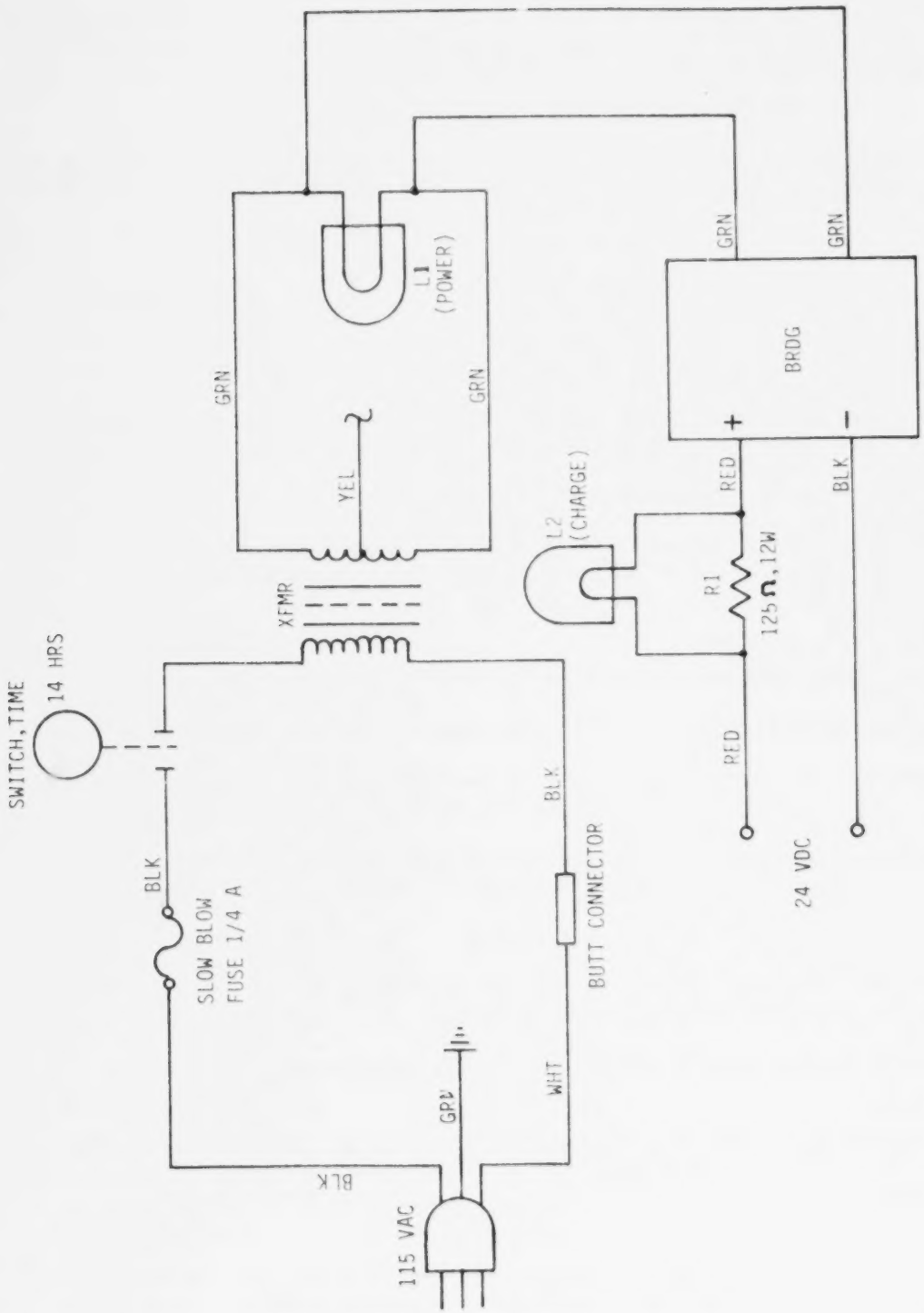


Figure 5-3. 24 VDC Battery Charger

The bridge rectifier circuits rectify the 30 VAC input and develops 24 VDC. The CHARGE lamp L2 illuminates only when the charger is connected to a battery and current begins to flow in the circuit.

Section III. GENERAL MAINTENANCE

5-20. **GENERAL.** Refer to TM 55-1500-323-25 for replacement of point-to-point wiring and wiring harnesses.

CHAPTER 6

REPAIR INSTRUCTIONS

Section I. Target Holding Mechanism/ Tank Gunnery

6-1. DESCRIPTION. The THM/TG is a stationary armor target device that receives encoded target control data from the OCD/Transmitter or the RCS.

6-2. HIT SENSOR ASSEMBLY. (See figure 6-1.)

a. Removal.

(1) Disconnect the sensor (2) from the housing (1) by removing the screw (3).

(2) Tag the sensor prong that has the white lead connected to it. Disconnect the spade connectors (4) from the sensor (2).

(3) Cut the spade connectors (4) from the wiring harness (5).

(4) Remove the retaining plate (6) by removing the two screws (7) and lockwashers (8) from the housing (1).

b. Installation.

(1) Install the wiring harness (5) into the housing (1).

(2) Connect the spade connectors (4) to the wiring harness (5).

(3) Connect the spade connectors (4) to the sensor (2). Connect the white wire lead to the tagged prong.

(4) Install the retaining plate (6) into the housing (1) and secure it with two screws (7) and two lockwashers (8).

NOTE

If the protective gasket was removed during disassembly, install a gasket at this time.

(5) Connect the sensor (2) to the housing (1) and secure it with a screw (3).

6-3. HYDRAULIC CYLINDER. Repair of the hydraulic cylinder is performed according to the following procedures. (See figure 6-2.)

CAUTION

A hydraulic cylinder repair kit must be on hand before beginning this repair. Failure to use this kit will degrade performance.

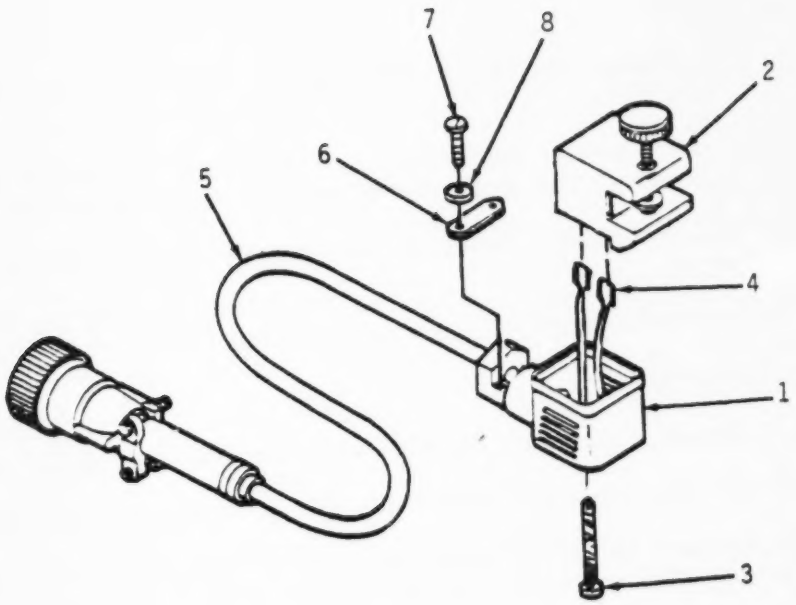


Figure 6-1. Hit Sensor Assembly

NOTE

Place a rod in the front bearing as an aid in pulling the piston rod forward.

a. Removal

(1) Position the hydraulic cylinder so the that front hydraulic port is on the bottom, and drain the hydraulic fluid by pulling forward on the piston rod (1).

(2) Remove the barrel collar (2) from the barrel assembly (3) with a spanner wrench.

(3) Remove the piston rod assembly by pulling the piston rod (1) forward.

(4) Place the piston rod assembly on a clean surface and remove any excess hydraulic fluid.

NOTE

Care must be taken to ensure that the piston rod assembly sealing surfaces are not damaged.

(5) Check the cushion spear (4) for freedom of movement.

(6) Hold the piston rod (1) and unscrew the piston (5) using a spanner wrench. Clean the piston and piston rod threads (6). Place on a clean surface.

(7) Remove the piston and the rod seal (11) from the piston rod (1).

(8) Remove the gland (7) from the piston rod (1). Place the gland (7) and the piston rod (1) on a clean surface.

(9) Remove the two piston wear rings (8) from the piston (5).

(10) Remove the piston seal (9) from the piston (5).

(11) Remove the piston seal expander (10) located underneath the piston seal (9) on the piston (5).

(12) Remove the rod seal (12) from the gland (7).

(13) Remove the rod seal expander (13) located underneath the rod seal (12) on the gland (7).

(14) Remove the gland seal (14) from the gland (7).

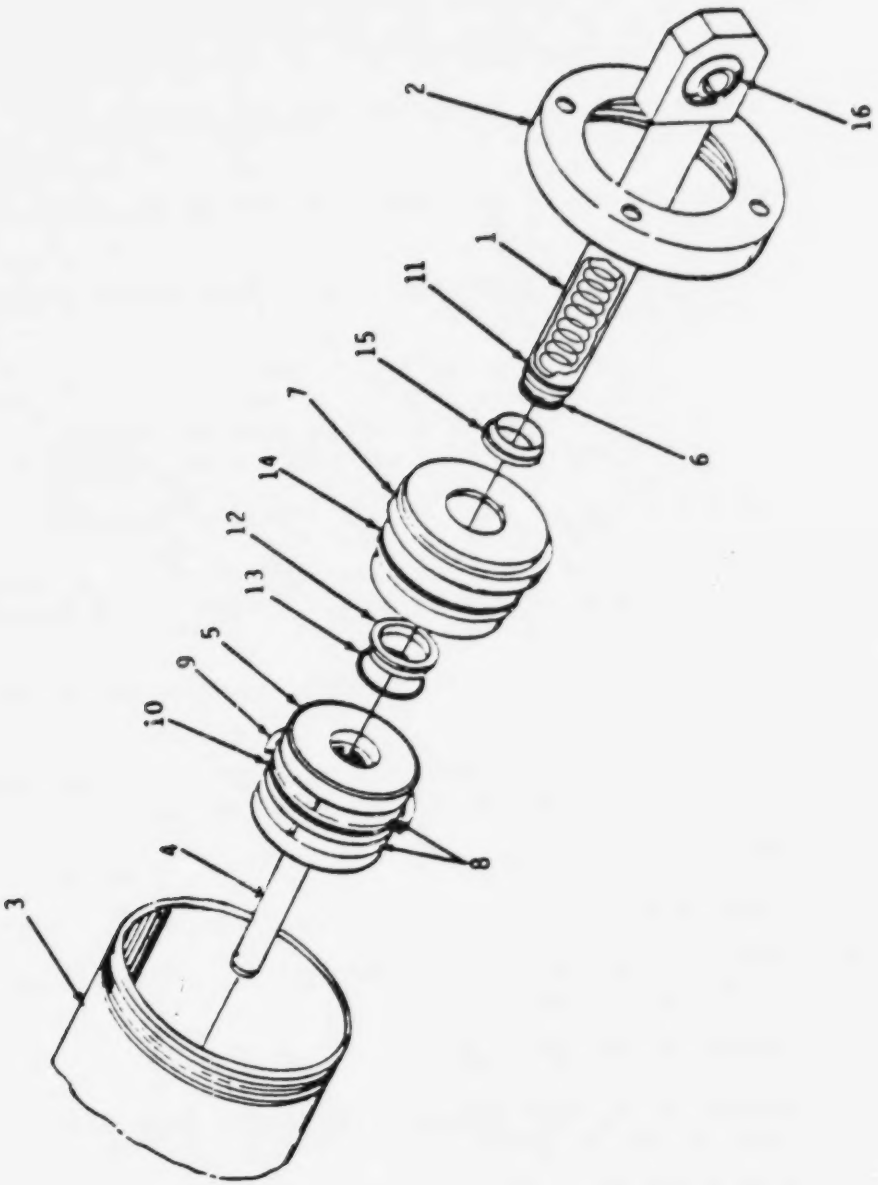


Figure 6-2. Hydraulic Cylinder Repair

(15) Remove the rod wiper (15) from the gland (7).

CAUTION

New seals from a repair kit must be used.
Use of old seals will degrade performance.

b. Installation

(1) Install the two replacement piston wear rings (8) onto the piston (5).

(2) Install the replacement piston seal expander (10) on the piston (5).

(3) Install the replacement piston seal (9) on top of the new piston seal expander (10).

NOTE

The rod seal expander (13) must be placed facing to the rear of the gland (7).

(4) Install the replacement rod seal expander (13) into the gland (7) facing to the rear of the gland.

(5) Install the replacement rod seal (12), facing to the rear of the gland (7) and covering the new rod seal expander (13).

(6) Install the replacement gland seal (14) onto the gland (7).

(7) Install the replacement rod wiper (15) with the flat surface facing to the rear of the gland (7) (beveled edge to the front of the gland).

(8) Ensure that the piston (5), piston rod (1), and piston rod threads (6) are clean.

(9) Position the gland (7) with the new rod wiper (15) to the front; then slide the gland (7) onto the piston rod (1).

(10) Coat the piston rod threads (6) with loctite.

(11) Install the piston and the replacement rod seal (11) onto the piston rod (1) and tighten.

NOTE

Ensure that the cushion spear and spring are installed prior to putting the piston onto the piston rod.

(12) Clean the piston rod assembly (1) of all foreign matter.

(13) Coat all piston rod assembly surfaces with hydraulic fluid; then carefully insert the piston rod assembly into the barrel assembly (3), ensuring that the cushion spear (4) seats properly.

NOTE

Ensure that the barrel collar (2) is properly seated and not cross-threaded.

(14) Position the barrel collar (2) on the barrel assembly (3); then tighten the barrel collar with a spanner wrench.

(15) Clean the piston rod bearings (16) and lightly lubricate them with general purpose oil.

6-4. BEARING AND PILLOW BLOCK ASSEMBLY. (See figure 6-3.)

a. Removal.

(1) Remove the side cover (reference paragraph 4-17a).

(2) Remove the P3 cable assembly (reference paragraphs 4-24a and 4-25a).

(3) Remove one cotter pin (1) from the journal (2) that connnects the hydraulic cylinder (5) to the shaft (4).

(4) Remove the journal (2) to free the end of the hydraulic cylinder (5) from the shaft (4).

(5) Retain the two plastic washers (3) for reuse.

(6) Lower the end of the hydraulic cylinder (5) clear of the shaft (4).

(7) Using the appropriate size drift pin, drive the two spring pins (6) down through the pillow block (7).

(8) Remove the two socket head screws (8) and lockwashers (9) from the pillow block (7).

(9) Remove the pillow block (7) from the shaft (4) and baseplate (10). Set the seal (11) aside for reuse.

(10) The remaining pillow block is removed by repeating steps (3) through (9).

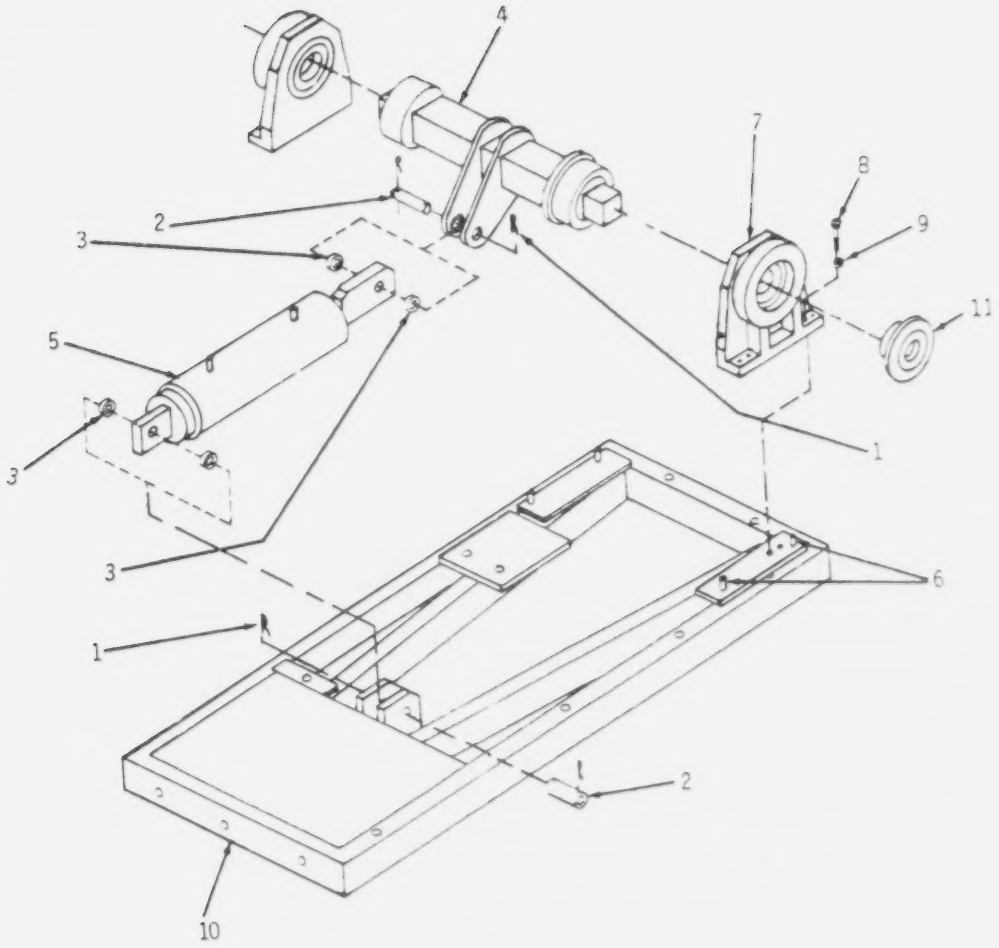


Figure 6-3. Bearing and Pillow Block Assembly

b. Installation.

(1) Properly position the pillow blocks (7) on the baseplate (10) and shaft (4), and insert two lockwashers (9) and two socket head screws (8) into each pillow block (7); then insert the seals.

(2) Evenly tighten the socket head screws (8) while turning the drive shaft (4) continuously to detect any binding. Once the screws are securely tightened, the drive shaft should rotate without binding.

(3) Locate the spring pin (6) holes in the removed pillow block. Drill holes (3/16" in diameter) in the replacement pillow blocks, no closer than 1/6" to the existing hole in the baseplate (10).

(4) Drive two spring pins (6) into each pillow block, locking the pillow blocks to the base plate (10).

(5) Install the end of the hydraulic cylinder (5) onto the shaft (4) and secure the cylinder to the shaft with a journal (2), two plastic washers (3), and cotter pin (1).

(6) Install the P3 cable assembly (references paragraphs 4-24b and 4-25b).

(7) Replace the side cover (reference paragraph 4-20b).

6-5. BASE FRAME AND PLATE. (See figure 6-4.)

a. Removal.

(1) Remove the cover assembly (reference paragraph 4-17a).

(2) Remove the protective frame (reference paragraph 4-26a).

(3) Remove the side cover (reference paragraph 4-20a).

(4) Remove the hydraulic unit (reference paragraph 4-21a).

(5) Remove the hydraulic cylinder (reference paragraph 4-23a).

(6) Remove the pillow blocks (reference paragraph 6-4a).

(7) Remove the eight screws (1), lockwashers (2), and flatwashers (3) holding the base plate (4) to the base frame (5).

b. Installation.

(1) Attach the base plate (4) to the base frame (5) with eight flatwashers (3), eight lockwashers (2), and eight screws (1).

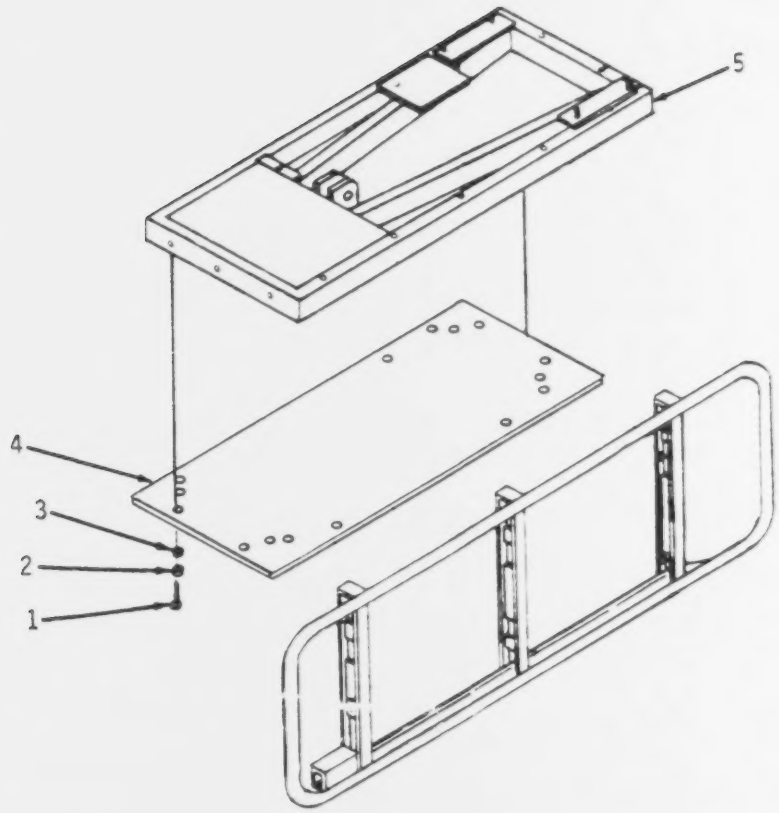


Figure 6-4. Base Frame and Plate.

(2) Install the pillow blocks (reference paragraph 6-4b).

(3) Install the hydraulic cylinder (reference paragraph 4-23b).

(4) Install the hydraulic unit (reference paragraph 4-21b).

(5) Install the side cover (reference paragraph 4-20b).

(6) Install the protective frame (reference paragraph 4-26b).

(7) Install the cover assembly (reference paragraph 4-17b).

6-6. IDENTIFICATION PLATE. (See figure 6-5.)

NOTE

Record all information contained on the old identification plate and transfer that information to the replacement identification plate.

a. Removal.

(1) Scrape the old identification plate (1) from the cover plate (2) with a knife.

(2) Clean the surface thoroughly.

b. Installation.

(1) Remove the protective backing from the replacement identification plate (1).

(2) Firmly press the replacement identification plate (1) into place.

6-7. LOGIC CIRCUIT CARD ASSEMBLY (CCA). (See figure 6-5.)

CAUTION

The cover plate assembly (2) is separated from the housing (3) to allow maintenance on the unit. Extreme care must be taken to avoid damage to the electrical wiring.

a. Removal.

(1) Remove the ten screws (4) and lockwashers (5) which secure the cover plate (2) to the housing (3).

(2) Slowly separate the cover plate (2) from the housing (3).

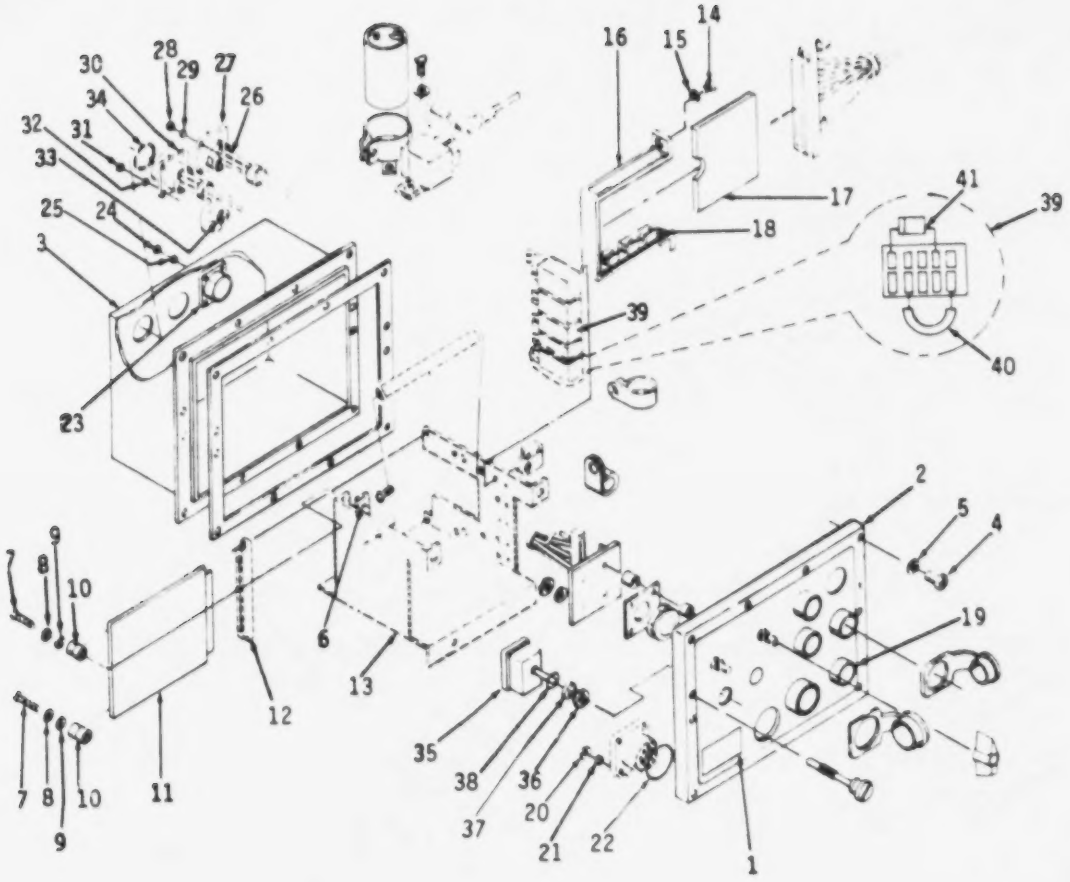


Figure 6-5. Electronic Control Assembly
(Sheet 1 of 2)

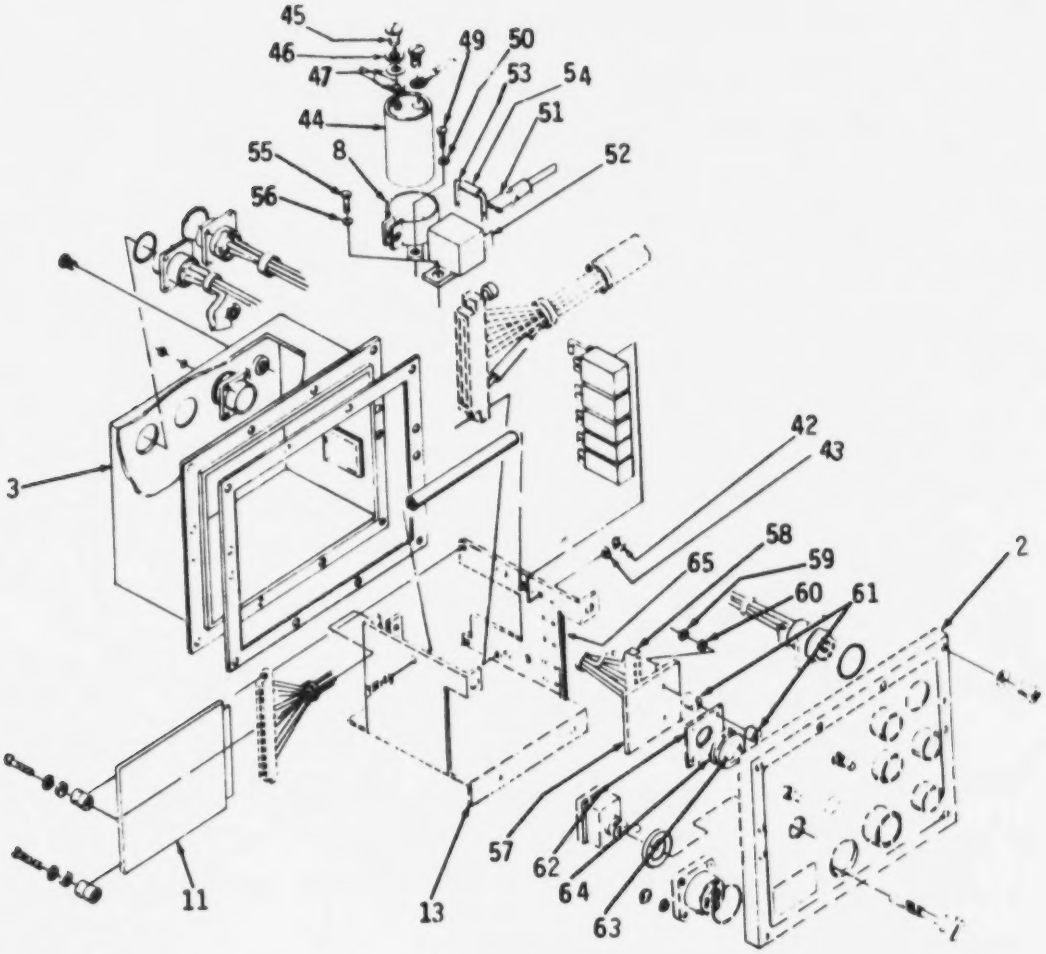


Figure 6-5. Electronic Control Assembly
(Sheet 2 of 2)

(3) Support the CCA mounting plate (6) and remove the screws (7), lockwashers (8), and flat washers (9) from each of the two sleeve spaces (10). Remove the spacers (10) and the CCA mounting plate (6).

(4) Remove the logic CCA (11) by pulling the CCA straight out from the electrical receptacle connector (12).

b. Installation.

(1) Install the logic CCA (11) by firmly pushing it into the CCA electrical receptacle connector (12).

(2) Position the CCA mounting plate (6) on the chassis (13).

(3) Install each of the two sleeve spacers (10) with a flat washer (9), a lockwasher (8), and a screw (7).

(4) Position the cover plate (2) on the housing (3), and secure with ten lockwashers (5) and ten screws (4).

6-8. **AMPLIFIER CCA.** (See figure 6-5.)

a. Removal.

(1) Separate the cover plate (2) from the housing (3) (reference paragraph 6-7a).

(2) Remove the logic CCA (11) (reference paragraph 6-7a).

(3) Remove the two screws (14) and lockwashers (15) which secure the board holder (16) and the amplifier CCA (17) to the chassis (13). Slide the holder outward and remove it.

(4) Remove the amplifier CCA (17) by pulling it outward from the board holder (16).

b. Repair.

(1) Snap the card guides (18) from the amplifier CCA holder (16).

(2) Position the replacement card guides (18) on the amplifier CCA holder (16) and firmly press them into place.

c. Installation.

(1) Install the amplifier CCA (17) by firmly pushing it into the board holder (16).

(2) Install the CCA board holder (16) and amplifier (17) assembly. Secure it to the chassis (13) with two lockwashers (15) and two screws (14).

(3) Install the logic CCA (11) (reference paragraph 6-7b).

(4) Connect the cover plate (2) to the housing (reference paragraph 6-7b(4)).

6-9. CCA, BATTERY TEST. (See figure 6-5.)

a. Removal.

(1) Separate the cover plate (2) from the housing (3) (reference paragraph 6-7a (1) and (2)).

(2) Remove the logic CCA (11) (reference paragraph 6-7a).

(3) Remove the amplifier CCA (17) (reference paragraph 6-8a).

(4) Unplug the electrical connector (58) from the battery test CCA (57).

(5) Remove the four nuts (59) and washers (60) that secure the battery test CCA (57), and remove the battery test CCA.

b. Installation.

(1) Position the replacement battery test CCA (57) on the captive screws and secure it with four washers (60) and four nuts (59).

(2) Connect the electrical connector (58) to the battery test CCA (57).

(3) Install the amplifier CCA (17) (reference paragraph 6-8b).

(4) Install the logic CCA (11) (reference paragraph 6-7b).

(5) Connect the cover plate (2) to the housing (3) (reference paragraph 6-7b(4)).

6-10. LENS, BATTERY CHECK. (See figure 6-5.)

a. Removal.

(1) Separate the cover plate (2) from the housing (3) (reference paragraph 6-7a (1) and (2)).

(2) Remove the logic CCA (11) (reference paragraph 6-7a).

(3) Remove the amplifier CCA (17) (reference paragraph 6-8a).

(4) Remove the battery test CCA (57) (reference paragraph 6-9a).

(5) Remove the four spacers (61) and the lens plate (62).

(6) Remove the lens (63) and "O" ring (64) from the lens plate (62) cut-out. Clean the old RTV from the lens plate (62) cut-out.

b. Installation.

(1) Replace the "O" ring (64) on the replacement lens (63) and apply a thin coat of RTV compound on the lens (63); then insert the lens into the lens plate (62) cut-out.

(2) Replace the lens plate (62) and the four spacers (61).

(3) Replace the battery test CCA (57) (reference paragraph 6-9b).

(4) Install the amplifier CCA (17) (reference paragraph 6-8b).

(5) Install the logic CCA (11) (reference paragraph 6-7b).

(6) Connect the cover plate (2) to the housing (3) (reference paragraph 6-7b(4)).

6-11. ELECTRICAL RECEPTACLE CONNECTOR, LAMP. (See figure 6-5.)

a. Removal.

(1) Separate the cover plate (2) from the housing (3) (reference paragraph 6-7a(1) and (2)).

(2) Tag and unsolder the electrical leads from the lamp receptacle connector (19) pins.

(3) Remove the four nuts (20) and washers (21) which secure the lamp electrical connector (19) to the cover plate (2). Remove the lamp electrical connector (19) and the "O" ring (22).

b. Installation.

(1) Place an "O" ring (22) on the electrical connector (19), and secure the electrical connector to the cover plate (2) with four washers (21) and four nuts (20).

(2) Solder the tagged electrical leads to the lamp electrical connector (19) pins in proper order (see FO-11).

(3) Connect the cover plate (2) to the housing (3) (reference paragraph 6-7b(4)).

6-12. ELECTRICAL RECEPTACLE CONNECTOR, P3. (See figure 6-5.)

a. Removal.

(1) Separate the cover plate (2) from the housing (3) (reference paragraph 6-7a(1) and (2)).

(2) Tag and unsolder the electrical leads from the P3 connector (23) pins.

(3) Remove the four nuts (24) and four washers (25) which secure the P3 connector (23) to the rear of the housing (3); then remove the P3 connector with the "O" ring.

(4) Scrape away the old RTV sealing compound with a putty knife.

b. Installation.

(1) Apply RTV sealing compound to the P3 connector housing and insert the connector (23).

(2) Secure the connector (23) to the housing (3) with four washers (25) and four nuts (24).

(3) Place insulation sleeving on the electrical leads; then solder the tagged electrical leads to the P3 connector (23) pins in proper order (see FO-11).

(4) Connect the cover plate (2) to housing (3) (reference paragraph 6-7b(4)).

6-13. ELECTRICAL RECEPTACLE CONNECTOR, P2. (See figure 6-5.)

a. Removal.

(1) Separate the cover plate (2) from the housing (3) (reference paragraph 6-7a(1) and (2)).

(2) Cut the insulation sleeving (26) from the soldered P2 connector (27) pins.

(3) Tag and unsolder the electrical leads and the capacitor from the P2 connector (27) pins (see figure FO-11).

(4) Remove the four nuts (28) and washers (29) which secure the connector (27) to the housing (3). Remove the P2 connector (27) and the "O" ring.

b. Installation.

(1) Place an "O" ring on the P2 electrical connector (27), and secure the connector (27) to the housing (3) with four nuts (28) and four washers (29).

(2) Place insulation sleeving (26) on the tagged electrical leads and the capacitor.

(3) Solder the tagged electrical leads to the P2 connector (27) pins in order (see figure FO-11).

(4) Connect the cover plate (2) to the housing (3) (reference paragraph 6-7b(4)).

6-14. ELECTRICAL RECEPTACLE CONNECTOR, P1. (See figure 6-5.)

a. Removal.

(1) Separate the cover plate (2) from the housing (3) (reference paragraph 6-7a(1) and (2)).

(2) Cut insulation; then tag and unsolder the electrical leads from the P1 connector (30) pins (see figure FO-11).

(3) Remove the four nuts (31), four washers (32), and the one ground-lug (33) that secures the P1 connector (30) to the housing (3); then remove the connector (30) and the "O" ring (34).

b. Installation.

(1) Position an "O" ring (34) and the P1 electrical connector (30) on the housing (3); then secure the P1 electrical connector (30) and the ground lead (33) to the housing (3) with four nuts (31) and four washers (32).

(2) Place insulation sleeving on the tagged electrical leads; then solder the electrical leads to the P1 connector (30) pins in order (see figure FO-11).

(3) Connect the plate (2) to the housing (3) (reference paragraph 6-7b(4)).

6-15. SWITCH, TOGGLE (TEST). (See figure 6-5.)

a. Removal.

(1) Separate the cover plate (2) from the housing (3) (reference paragraph 6-7a(1) and (2)).

(2) Remove the amplifier CCA (11) (reference paragraph 6-7a).

(3) Remove the amplifier CCA (17) (reference paragraph 6-8a).

(4) Remove the C1 capacitor (44) (reference paragraph 6-18a).

(5) Remove the battery test CCA (57) (reference paragraph 6-9a).

(6) Tag and unsolder the electrical wiring leads and the jumper wire from the toggle switch (35) contacts (see FO-11).

(7) Remove the nut (36) and washer (37) that secure the toggle switch (35) to the plate (2); then remove the toggle switch (35) and the "O" ring (38).

b. Installation.

(1) Position an "O" ring (38) on the toggle switch (35); then secure the switch to the plate with a washer (37) and a nut (36).

(2) Solder the tagged electrical wiring leads to the toggle switch (35) contacts (see FO-11).

(3) Install the battery check CCA (62) (reference paragraph 6-9b).

(4) Install the C1 capacitor (44) (reference paragraph 6-18b).

(5) Install the amplifier CCA (17) (reference paragraph 6-8b).

(6) Install the logic CCA (11) (reference paragraph 6-7b).

(7) Connect the cover plate (2) to the housing (3) (reference paragraph 6-7b(4)).

6-16. HOUSING, ELECTRONIC CONTROL UNIT. (See figure 6-5.)

a. Removal.

(1) Separate the cover plate (2) from the housing (3) (reference paragraph 6-7a(1) and (2)).

(2) Remove the four nuts (24), washers (25), and the "O" ring (34) from the electrical connectors P3 (23), P2 (27), and P1 (30); then separate the connectors from the housing (3).

(3) Remove the sealing plug from the housing (3).

(4) Remove the activated dessicant from the interior of the housing (3).

b. Installation.

(1) Secure the electrical connectors P1 (30), P2 (27), and P3 (23) to the housing with four washers (25), four nuts (24), and an "O" ring (34) for each connector.

(2) Insert the sealing plug.

(3) Position the activated dessicant to the interior of the housing (3) and secure it with a strip of tape.

(4) Connect the cover plate (2) to the housing (3) (reference paragraph 6-7b(4)).

6-17. RELAY ASSEMBLIES, K1 THROUGH K4 and K6. (See figure 6-5.)

NOTE

The diodes and the jumper wires that are removed from relays K1 through K4 and K6 must be retained for installation on replacement relays.

a. Removal.

(1) Separate the cover plate (2) from the housing (3) (reference paragraph 6-7a(1) and (2)).

(2) Remove the logic CCA (11) (reference paragraph 6-7a).

(3) Remove the amplifier CCA (17) (reference paragraph 6-8a).

(4) Remove the insulation sleeving; then tag and unsolder the electrical leads from the K1 relay (39) contacts (see FO-11).

(5) Unsolder the jumper wire (40) from pins 7 and 10 on the K1 relay (39).

CAUTION

Use only the heat required for unsoldering. Excessive heat can damage diodes.

(6) Unsolder the diodes (41) from the K1 relay (39) pins 1 and 4.

(7) Remove the nut (42) and lockwasher (43) that secure the K1 relay (39) to the chassis (13); then remove the K1 relay (39).

(8) Repeat this procedure for relays K2 through K4 and K6.

b. Installation.

(1) Solder the diodes (41) onto pins 1 and 4 of the replacement relay (39). Make sure that the black banded end of the diode (41) goes to pin 1.

(2) Position the replacement relay (39) on the chassis (13); then secure the relay with a lockwasher (43), and a nut (42).

(3) Solder the jumper wire (40) between pins 7 and 10 of the replacement relay.

(4) Place sleeving on the tagged electrical leads; then solder the leads to the correct relay (39) contacts.

(5) Repeat this procedure for relays K2 through K4 and K6.

(6) Install the amplifier CCA (17) (reference paragraph 6-8b).

(7) Install the logic CCA (11) (reference paragraph 6-7b).

(8) Connect the cover plate (2) to the housing (3) (reference paragraph 6-7b(4)).

6-18. CAPACITOR, C1. (See figure 6-5, sheet 2.)

WARNING

To prevent the possibility of electrical shock, discharge the C1 capacitor (44) by grounding the positive terminal (+) with a metal object.

a. Removal.

(1) Separate the cover plate (2) from the housing (3) (reference paragraph 6-7a(1) and (2)).

(2) Remove the logic CCA (11) (reference paragraph 6-7a).

(3) Tag the positive (+) and negative (-) electrical leads on the C1 capacitor (44) (see FO-11).

(4) Remove the two screws (45), lockwashers (46), and flat washers (47) from the C1 capacitor (44).

(5) Loosen the nut on the capacitor (44) loop clamp (48), and remove the capacitor (44).

b. Installation.

(1) Position a replacement C1 capacitor (44) in the loop clamp (48) and tighten the nut.

(2) Correctly install the tagged positive (+) and negative (-) electrical leads onto the capacitor with two flat washers (47), two lockwashers (46), and two screws (45).

(3) Install the logic CCA (11) (reference paragraph 6-7b).

(4) Connect the cover plate (2) to the housing (3) (reference paragraph 6-7b(4)).

6-19. LOOP CLAMP. (See figure 6-5, sheet 2.)

a. Removal.

(1) Separate the cover plate (2) from the housing (3) (reference paragraph 6-7a(1) and (2)).

(2) Remove the logic CCA (11) (reference paragraph 6-7a).

(3) Remove the C1 capacitor (44) (reference paragraph 6-18a).

(4) Remove the three screws (49) and lockwashers (50) that secure the loop clamp (48) to the chassis (13).

(5) Remove the loop clamp (48).

b. Installation.

(1) Position the loop clamp (48) on the chassis (13); then secure the clamp with three screws (49) and three lockwashers (50).

(2) Install the C1 capacitor (44) (reference paragraph 6-18b).

(3) Install the logic CCA (11) (reference paragraph 6-7b).

(4) Connect the cover plate (2) to the housing (3) (reference paragraph 6-7b(4)).

6-20. **RELAY K5.** (See figure 6-5, sheet 2.)

a. Removal.

(1) Separate the cover plate (2) from the housing (3) (reference paragraph 6-7a(1) and (2)).

(2) Remove the logic CCA (11) (reference paragraph 6-7a).

(3) Remove the C1 capacitor (44) (reference paragraph 6-18a).

(4) Tag and unplug the quick disconnect terminals (51) from the K5 relay (52). (See figure FO-11.)

(5) Cut the insulation sleeving (53) from the semiconductor device (54) leads; then unsolder the leads from the K5 relay (52) terminals.

(6) Remove the screw (55) and lockwasher (56) that secure the K5 relay (52) to the chassis (13).

(7) Lift out the K5 relay (52).

b. Installation.

(1) Place insulation sleeving (53) on the semiconductor device (54) leads; then solder the leads to the correct K5 relay terminals.

(2) Position a replacement K5 relay (52) on the chassis (13); then secure the relay with one lockwasher (56) and one screw (55).

(3) Connect the tagged electrical leads to the K5 relay (52) by firmly seating the quick disconnect terminals (51) (see FO-11).

(4) Install the C1 capacitor (44) (reference paragraph 6-18b).

(5) Install the logic CCA (11) (reference paragraph 6-7b).

(6) Connect the cover plate (2) to the housing (3) (reference paragraph 6-7b(4)).

6-21. COVER, PROTECTIVE. (See figure 6-5, sheet 2.)

a. Removal.

(1) Separate the cover plate (2) from the housing (3) (reference paragraph 6-7a(1) and (2)).

(2) Remove the protective cover (65) by pulling it from the chassis (13).

b. Installation.

(1) Position the protective cover (65) on the chassis (13); then firmly press it into place.

(2) Connect the cover plate (2) to the housing (3) (reference paragraph 6-7b(4)).

6-22. CABLE, LIMIT SWITCH, P3. (See figure 6-6.) Repair of the P3 limit switch cable is accomplished by the following procedures.

a. Repair.

(1) Strip one half inch of the insulation from the replacement S1 switch (1) leads and the special purpose cable (2) leads.

NOTE

Do not crimp the heat shrink tubing.

(2) Place heat shrink tubing (3) over the replacement S1 switch (1) leads.

(3) Place the correct stripped ends of the leads from the replacement S1 switch (1) and the special purpose cable (2) into a crimp connector (4) and crimp securely.

(4) Place the stripped end of the second lead from the replacement S1 switch (1) and the stripped leads from the S2 (5) and the S3 switches (6) into a crimp connector (7) along with the special purpose cable (2) leads. Crimp securely.

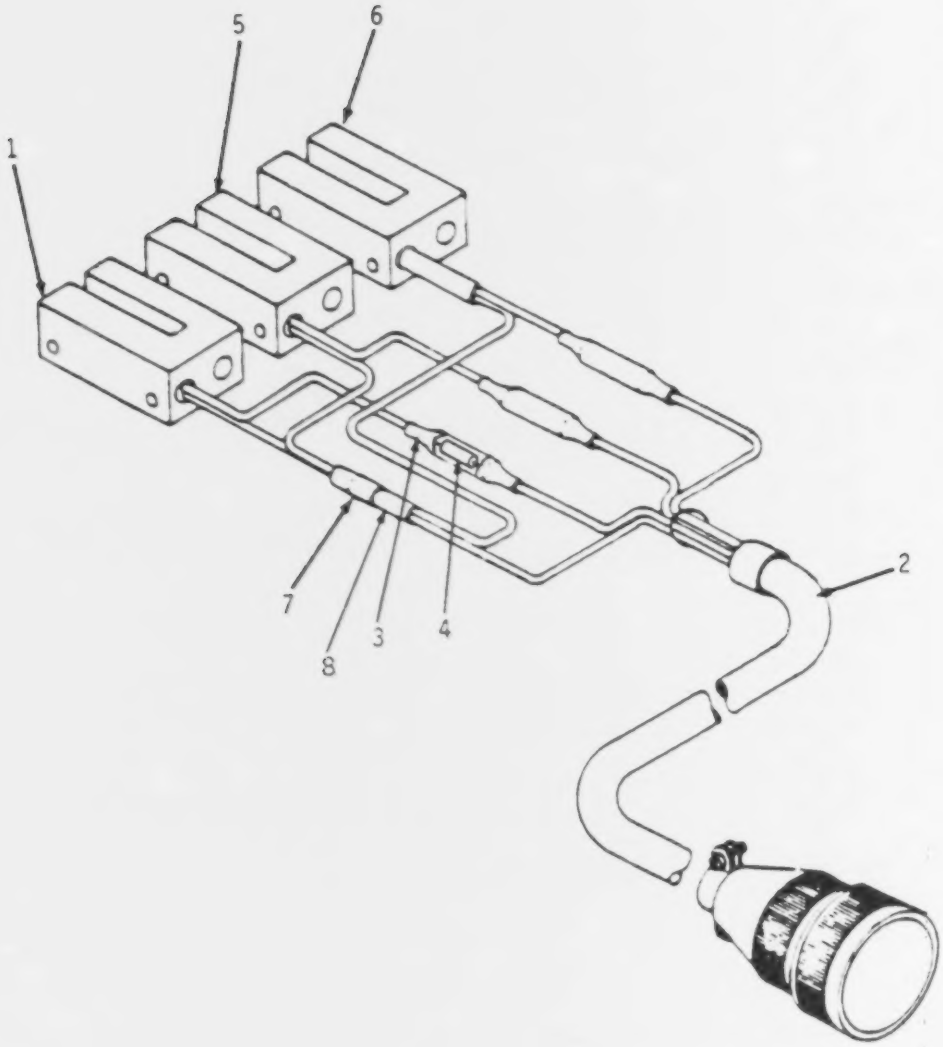


Figure 6-6. Cable, P3 Limit Switch

(5) Apply silicone sealant to the open ends of the heat shrink tubing.

(6) Apply heat to the heat shrink tubing ((3) and (8)) moving from the middle outward.

NOTE

Magnetic switches S2 and S3 are repaired in the same manner as the S1 switch.

Section II. Battery Charger

6-23. DESCRIPTION. The battery charger is on the electronic assembly which is used to charge the transmitter battery.

6-24. COVER ASSEMBLY. (See figure 6-7, sheet 1.)

a. Removal.

(1) Remove the six screws (1) from the cover assembly (2) and lift the cover to allow access to battery lugs (3).

(2) Tag the leads and remove the nuts (4), lockwashers (5), leads (6), and flatwashers (7) from the cover assembly (2); then remove the cover assembly.

b. Installation.

(1) Connect the battery lugs (3) to the cover (2). Secure each battery lug with a flatwasher (7), a tagged lead (6), a lockwasher (5), and a nut (4).

(2) Align the cover assembly (2) on the battery charger box (8). Secure the cover assembly (2) with six screws (1).

6-25. POWER LAMP ASSEMBLY, L1. (See figure 6-7, sheet 1.)

a. Removal.

(1) Remove the cover assembly (reference paragraph 6-24a).

(2) Remove the shrink tubing and tag the four leads on the lamp socket (9). Unsolder the four leads from the lamp socket.

(3) Remove the nut (10) and lockwasher (11) from the lamp socket (9). Extract the lamp socket (9) from the battery charger box (8).

b. Installation.

(1) Align the lamp socket (9) to the battery charger box (8), and secure the lamp socket with a lockwasher (11) and a nut (10).

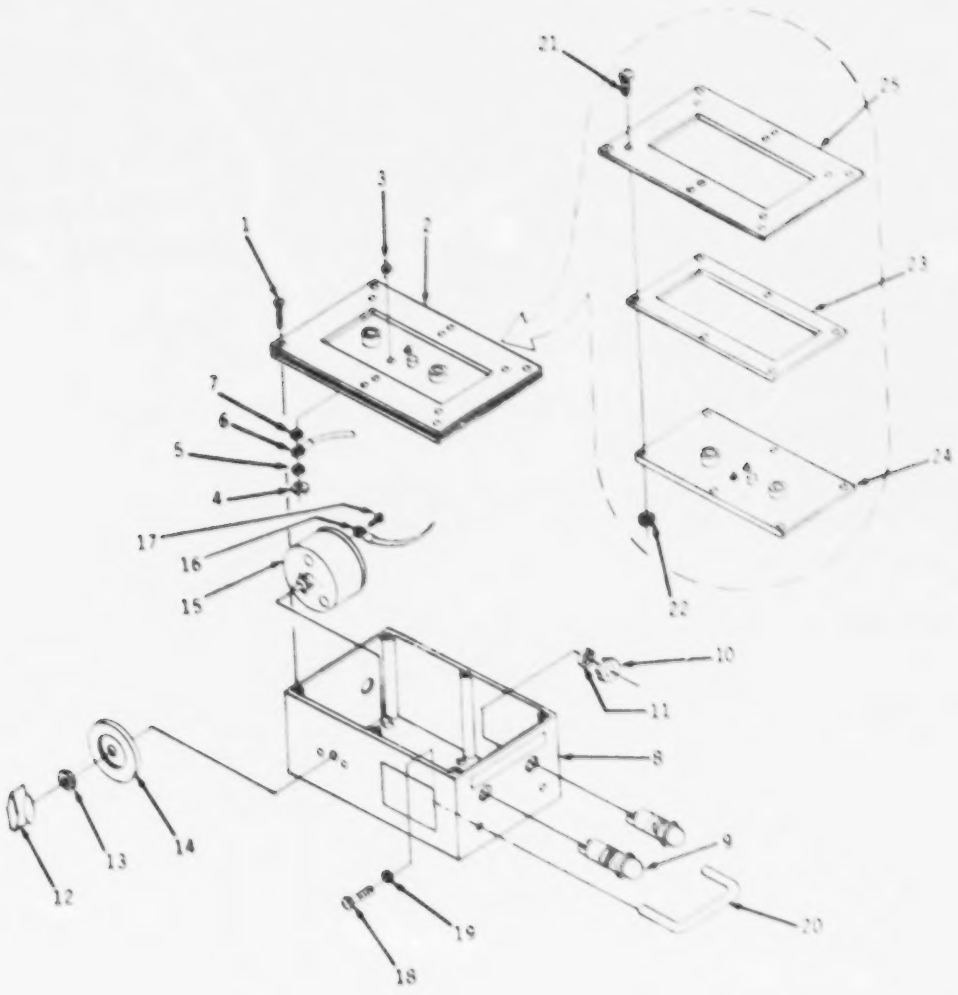


Figure 6-7. Battery Charger
(Sheet 1 of 2)

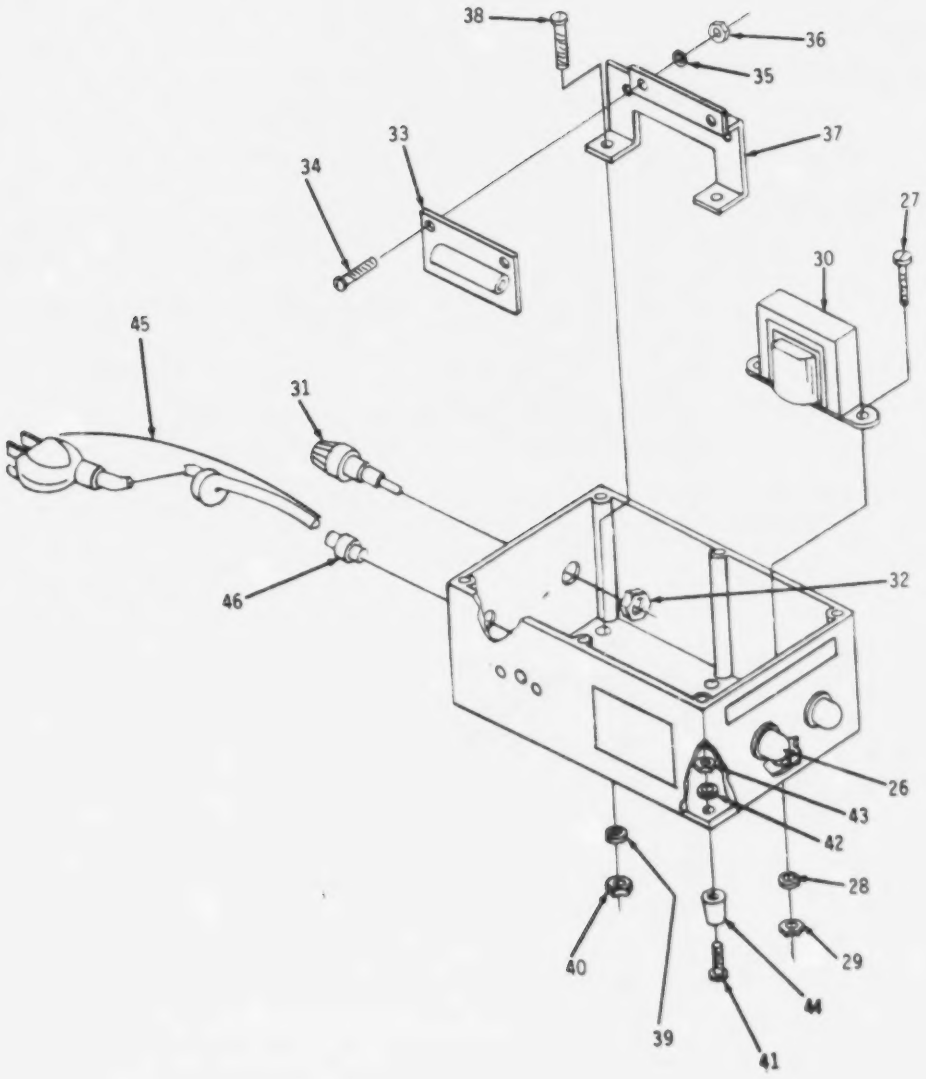


Figure 6-7. Battery Charger
(Sheet 2 of 2)

(2) Place new shrink tubing over the leads, solder the tagged leads to the lamp socket (9), and install the shrink tubing.

(3) Install the cover assembly (reference paragraph 6-24b).

6-26. CHARGE LAMP ASSEMBLY, L2. (See figure 6-7, sheet 1.)

NOTE

The L2 charge lamp is removed by the same procedure as the L1 power lamp (reference paragraph 6-25), except that there are only two leads to tag and unsolder.

6-27. TIME SWITCH. (See figure 6-7, sheet 1.)

a. Removal.

(1) Remove the cover assembly (reference paragraph 6-24a).

(2) Remove the knob (12), nut (13), and dial (14) from the time switch (15).

(3) Tag and remove the lead (16) by loosening the screws (17), remove the time switch (15) from the battery charger box (8).

b. Installation.

(1) Install the tagged lead (16) to the back of the time switch (15) with a screw (17).

(2) Align the time switch (15) to the battery charger box (8), and secure the time switch with the dial (14), nut (13), and knob (12).

(3) Install the cover assembly (reference paragraph 6-24b).

6-28. HANDLE. (See figure 6-7, sheet 1.)

a. Removal.

(1) Remove the cover assembly (reference paragraph 6-24a).

(2) Remove the two screws (18), two lockwashers (19) and the handle (20), from the battery charger box (8).

b. Installation.

(1) Align the handle (20) on battery charger box (8) and secure it with two screws (18), and two lockwashers (19).

(2) Install the cover assembly (reference paragraph 6-24b).

6-29. CHARGING PLATE ASSEMBLY. (See figure 6-7, sheet 1.)

a. Removal.

(1) Remove the cover assembly (reference paragraph 6-24a).

(2) Remove the six screws (21), six nuts (22), the gasket (23), and the charging plate (24) from the cover (25).

b. Installation.

(1) Align the gasket (23) and the charging plate (24) to the cover (25), and secure the cover with six screws (21) and six nuts (22).

(2) Install the cover assembly (reference paragraph 6-24b).

6-30. TRANSFORMER. (See figure 6-7, sheet 2.)

a. Removal.

(1) Remove the cover assembly (reference paragraph 6-24a).

(2) Remove the shrink tubing; then tag and unsolder the leads from the L1 power lamp (26).

(3) Tag and disconnect the lead from the time switch (15, Sheet 1) by loosening screw (17, sheet 1).

(4) Tag and disconnect the transformer lead connected to the power cord by removing the shrink tubing and the crimp.

(5) Remove the two screws (27), lockwashers (28), and nuts (29) that secure the transformer; then remove the transformer (30) from the battery charger box (8, sheet 1).

b. Installation.

(1) Align the transformer (30) to the battery charger box (8, sheet 1), and secure the transformer to the battery box with two screws (27), two lockwashers (28), and two nuts (29).

(2) Position shrink tubing on the leads to be connected to the L1 power lamp (26), solder the tagged leads to the L1 power lamp (26), and install the shrink tubing.

(3) Install the tagged transformer lead (16, sheet 1) to the time switch (15, sheet 1) and secure the lead with a screw (17, sheet 1).

(4) Position shrink tubing on the transformer lead to be connected to the power cord. Connect the leads with a crimp and install the shrink tubing.

(5) Install the cover assembly (reference pargraph 6-24b).

6-31. FUSE HOLDER. (See figure 6-7, sheet 2.)

a. Removal.

(1) Remove the cover assembly (reference paragraph 6-24b).

(2) Remove fuse and fuse holder (31).

(3) Remove the shrink tubing; then tag and unsolder the leads on the fuse holder (31).

(4) Remove the nut (32) and the fuse holder (31) from the battery charger box (8, sheet 1).

b. Installation.

(1) Align the fuse holder (31) on the battery charger box (8, sheet 1); then secure the fuse holder with a nut (32).

(2) Position new shrink tubing on the tagged leads, solder the tagged leads to the fuse holder (31), and install the shrink tubing.

(3) Install fuse and fuse holder (31).

(4) Install the cover assembly (reference paragraph 6-24b).

6-32. CIRCUIT CARD ASSEMBLY (CCA). (See figure 6-7, sheet 2.)

a. Removal.

(1) Remove the cover assembly (reference paragraph 6-24a).

(2) Tag and unsolder the leads from CCA (33).

(3) Remove the two screws (34), lockwashers (35), nuts (36), and the CCA (33) from the CCA mounting bracket (37).

b. Installation.

(1) Align the CCA (33) to the CCA mounting bracket (37); then secure the CCA (33) with two screws (34), two lockwashers (35), and two nuts (36).

(2) Solder the tagged leads to the CCA (33).

(3) Install the cover assembly (reference paragraph 6-24b).

6-33. CIRCUIT CARD MOUNTING BRACKET. (See figure 6-7, sheet 2.)

a. Removal

(1) Remove the cover assembly (reference paragraph 6-24a).

(2) Remove the CCA (reference paragraph 6-32a).

(3) Remove the two screws (38), lockwashers (39), nuts (40), and the CCA mounting bracket (37) from the battery charger box (8, sheet 1).

b. Installation.

(1) Align the CCA mounting bracket (37) on the battery charger box (8, sheet 1) and secure the bracket with two screws (38), two lockwashers (39), and two nuts (40).

(2) Install the CCA (reference paragraph 6-32b).

(3) Install the cover assembly (reference paragraph 6-24b).

6-34. FOOT PAD. (See figure 6-7.) (Sheet 2OF2)

a. Removal.

(1) Remove the cover assembly (reference paragraph 6-24a).

(2) Remove the screw (41), lockwasher (42), nut (43), and foot pad (44) from the battery charger box (8, sheet 1).

(3) Remove ground wire and foot pad (44).

b. Installation.

(1) Connect ground wire to foot pad (44).

(2) Align the foot pad (44) on the battery charger box (8, sheet 1); then secure the foot pad (44) with a screw (41), a lockwasher (42), and a nut (43).

(3) Install the cover assembly (reference paragraph 6-24b).

NOTE

Each foot pad may be removed by following this procedure.

6-35. POWER CORD. (See figure 6-7, sheet 2.)

a. Removal.

(1) Remove the cover assembly (reference paragraph 6-24a).

(2) Remove the shrink tubing; then tag and unsolder the lead that is connected to the fuse holder (31).

(3) Tag the leads and remove the shrink tubing and the crimps.

(4) Remove the power cord (45) and its connector (46) from the battery charger box (8, sheet 1).

b. Installation.

(1) Align the power cord (45) and its connector (46) on the battery charger box (8, sheet 1).

(2) Position shrink tubing on the tagged lead that connects to the fuse holder (31), solder the tagged lead to the fuse holder (31), and install the shrink tubing.

(3) Position shrink tubing on the tagged leads, connect the leads with crimps, and install the shrink tubing.

(4) Install the cover assembly (reference paragraph 6-24b).

6-36. CABLE ASSEMBLY P1. (See figure 6-8.)

a. Removal

(1) Remove two screws (1), lockwashers (2), and clamp brackets (3) from cable connector (4).

(2) Unscrew cable coupling ring (5), and slide coupling ring (5) and collar (6) down the cable (7).

(3) Remove the heat shrink tubing (8) and grommet (9) from cable connector (4).

(4) Tag the cable leads (11) and, with an extraction tool, remove contact (10) and wires (11) from cable connector (4).

(5) Unsolder wires (11) from contacts (10).

NOTE

The other cable connector is removed in the same manner.

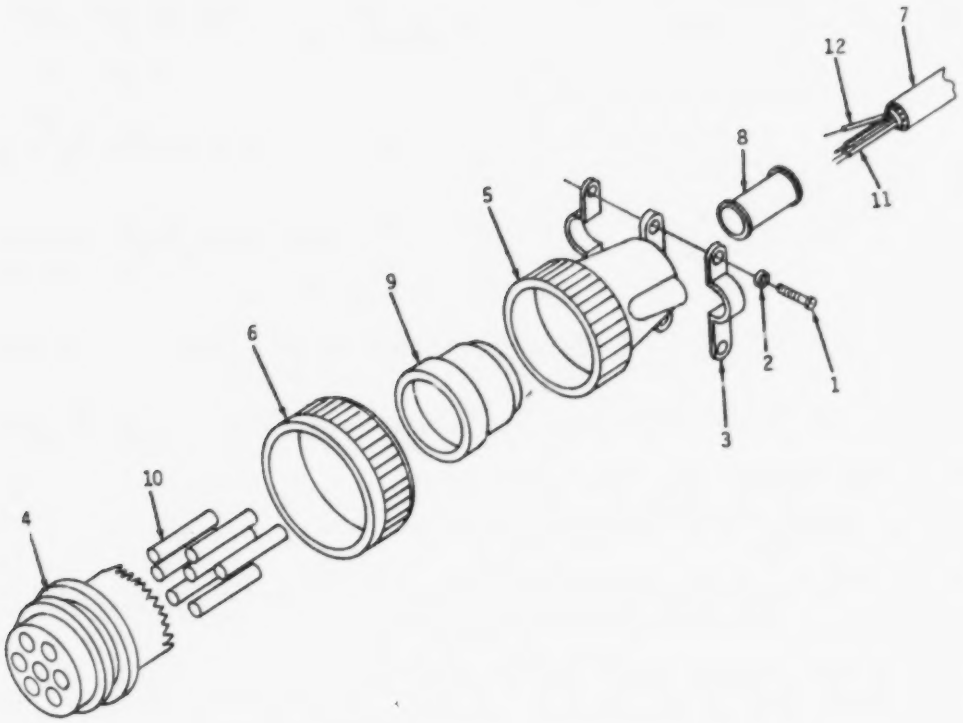


Figure 6-8. Repair of Cable Connectors

b. Installation

(1) Place coupling ring (5), collar (6) and new heat shrink tubing (8) onto cable (7).

(2) Insert tagged cable wiring (11) thorugh grommet (9) and then strip cable wiring (11) and solder into contacts (10) (see FO-11).

(3) Using an insertion tool, insert contacts (10) in to cable connector (4) and press grommet (9) into cable connector (4).

(4) Slide new heat shrink (8) on to cable wiring (11) and shrink into place.

(5) Slide collar (6) and coupling ring (5) onto cable connector (4) and tighten. Secure with two clamp brackets (3), lockwashers (2), and screws (1).

6-37. **CABLE CONNECTOR P2.** (See figure 6-8.)

a. Removal

(1) Remove two screws (1), lockwashers (2), and clamp bracket (3) from cable connector (4).

(2) Unscrew cable coupling ring (5) and slide coupling ring (5) and collar (6) down the cable (7).

(3) Remove the heat shrink tubing (8) and the grommet (9) from cable connector (4).

(4) Tag the cable leads (11) and, with an extraction tool, remove the contacts (10) and wires (11) from connector (4).

(5) Unsolder wires (11) from contacts (10).

NOTE

The other cable connector is removed in the same manner.

b. Installation

(1) Place coupling ring (5), collar (6), and new heat shrink tubing (8) onto cable (7).

(2) Place heat shrink tubing (12) on cable shield lead and then insert tagged leads (11) through grommet (9).

(3) Strip cable wires (11) and solder wires into contacts (10). (See FO-11.)

(4) Using an insertion tool, insert contacts (10) in to cable connector (4) and press the grommet (9) into cable connector (4). Slide new heat shrink (8) onto cable wires (11) and shrink into place.

(5) Slide collar (6) and coupling ring (5) onto cable connector,(4) and tighten. Secure connector with two clamp brackets (3), lockwasher (2), and screws (1).

CHAPTER 7

MAINTENANCE OF MATERIEL USED IN CONJUNCTION WITH MAJOR ITEM

7-1. This chapter is not applicable.

CHAPTER 8

FINAL INSPECTION/TEST

8-1. GENERAL. This chapter provides final inspection and test procedures to ensure that the Target Holding Mechanism/Tank Gunnery (THM/TG) is operating after repair. After satisfactory completion of these inspection/tests, the THM/TG should be returned to the user or returned to stock.

8-2. FINAL INSPECTION.

a. Check that the THM/TG housing is not damaged.

b. Check that the target arms are not damaged and that the hit sensors are mounted securely and cabled to the THM/TG.

c. Check the target arm assembly hubs for cracks.

d. Check that the FUNCTION switch, TEST switch, and SENSITIVITY switch operate smoothly and are securely fastened to the housing.

e. Check the electrical connectors for broken, loose, or bent contact pins and/or broken inserts.

f. Check the wiring inside the housing assembly for cracked or broken insulation.

g. Check that all hardware is securely fastened.

h Check the exterior finish for scratches and bare metal areas.

i. Install the cover assembly by fastening latches.

8-3. FINAL TEST.

a. Refer to paragraph 2-7 to perform the operational checkout.

b. Upon completion of final tests, serviceable units should be returned to the user or placed in stock.

CHAPTER 9

ADMINISTRATIVE STORAGE

9-1. GENERAL. This chapter provides instructions for preparing the Target Holding Mechanism/Tank Gunnery for administrative storage.

9-2. ADMINISTRATIVE STORAGE. Refer to TM 740-90-1. There are no supplemental instructions required for administrative storage other than those provided in TM 740-90-1.

APPENDIX A

REFERENCES

A-1. GENERAL. This appendix contains a list of publications that are necessary to maintain and operate the Target Holding Mechanism/Tank Gunnery.

A-2. REFERENCES.

a.	TM 9-6920-742-10	Operator's Manual for Console Target Training Set, Range Control Station RETS.
b.	TM 9-6920-742-24&P	Organizational, Direct Support, and General Support Maintenance Manual Including Repair Parts and Special Tools List for Console, Target Training Set, Range Control Station RETS.
c.	TM 9-6920-742-14&P-1	Operator, Organizational, Direct Support, and General Support Maintenance Manual Including Repair Parts and Special Tools List for Remoted Target Systems (RETS) Interconnecting Box: Target Interface.
d.	TM 740-90-1	Administrative Storage of Equipment
e.	TM 55-1500-323-25	Wiring, Electrical and Electronic Installation Practices.
f.	DA PAM 738-750	Maintenance Management Update
g.	DA PAM 310-1	Index of Technical Manuals, Technical Bulletins, Supply Manuals, Supply Bulletins, and Lubrication Orders
h.	FM 21-11	Basic First Aid for Soldiers

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. GENERAL. This section provides a general explanation of all maintenance and repair functions authorized at the various maintenance levels. The Maintenance Allocation Chart (MAC) in Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

B-2. MAINTENANCE FUNCTIONS. Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition; i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by resetting the operating characteristics to specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. This consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. The act of substituting a serviceable, like part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, or replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying army equipments/components.

B-3. COLUMN ENTRIES. Columns used in the maintenance allocation chart are explained below:

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in Column 2.

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance categories, appropriate "work time" figures will be shown for each category. The number of manhours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart.

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated functions.

f. Column 6, Remarks. Column 6 contains an alphabetic code which leads to the remark in Section IV of Apperdix B, which is pertinent to the item opposite the particular code.

B-4. COLUMN ENTRIES. Column entries used in the Tool and Test Equipment Requirements, Section III, are explained below.

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Category. The codes in this column indicate the maintenance category allocated the tool or test equipment and time in manhours (tenths of hours) to perform tasks.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for Manufacturers (FSCM) in parentheses.

B-5. COLUMN ENTRIES. Column entries used in Section IV - Remarks are explained below:

a. Reference Code. This code refers to the appropriate item listed in Section II - Maintenance Allocation Chart, Column 6.

b. Remarks. This column provides the required explanatory information necessary to clarify items appearing in Section II - Maintenance Allocation Chart.

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
00	Target Holding Mechanism, Tank Gunnery (11784500)	Inspect		.1					
		Test		.1					
		Service		.2					
		Replace		.3			**		
		Repair							
01	Radio Controlled Automatic Tank Target (11784501)	Inspect		.1					
		Test		.1					
		Service		.2				4,6,8,13	
		Replace		.3			**		
		Repair							
	Computer/Cable Controlled Automatic Tank Target (9375764)	Inspect		.1					
		Test		.1					
		Service		.2				4,6,8,13	
		Replace		.3			**		
		Repair							
0101	Lamp Assembly VHIL (11784475)	Inspect		.1					
		Replace		.1				4,6,8,13	
		Repair		.3					
0102	Battery Box Assembly (9375756)	Inspect		.1					
		Replace		.1					
		Repair		.5				3,4,8,9, 10,17	
0103	Receiver (11784801)	Inspect		.1				4,5,10	
		Replace		.1			**		
		Repair					**		
010301	Panel Assembly	Inspect					**		
		Repair							

* The subcolumns are as follows:

C-operator/crew
O-organizational
F-direct support
H-general support
D-depot

** Worktime is included in DMWR

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
010302	Cable Assembly, Special Purpose	Inspect					**		
		Repair					**		
0104	Hit Sensor Assembly (11784450)	Inspect		.1					
		Replace		.1					
		Repair			.3			4,5,7,9,	
010401	Hit Sensor Electrical Special Purpose Assembly (11784452)	Inspect			.1				
		Replace			.3				
		Repair			.5			4,5,7,8, 9,11,14,	
0105	Tank Target Assembly (11784502)	Inspect		.1					
		Replace		.1					
		Repair					**	4,6,8,13, 23	
	Cover Assembly (11784606)	Inspect		.1					
		Replace		.1				4	
		Repair		.3				4,14,16,21	
010501	Target Holder Assembly (11784506)	Inspect		.1					
		Replace		.1					
		Repair		.3				3,6,8,13, 18	
	Target Clamp Assembly (11784507)	Inspect		.1					
		Replace		.1				4	
		Repair		.3				3,6,8,13, 18,20	

* The subcolumns are as follows:

C-operator/crew
O-organizational
F-direct support
H-general support
D-depot

** Worktime is included in DMWR

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
010502	Hydraulic Cylinder (11784619-1)	Inspect Replace Repair		.1 .5	 2.0			2,8,10 2,8,10,11, 12	
010503	Electrical Special Purpose Cable Assembly (P1) (11784508)	Inspect Replace Repair		.1 .3	 .5			4,5,7,9, 14,26	
010504	Electrical Special Purpose Cable Assembly (P2) (11784509)	Inspect Replace Repair		.1 .3	 .5			4,5,7,9, 14,26	
010505	Electrical Special Purpose Cable Assembly (P3) (1184510)	Inspect Replace Repair		.1 .5	 1.0			1,4,5 2,4,6,7, 9,18,19, 25,26	
010506	Hydraulic Unit Assembly (9375758)	Inspect Replace Repair		.1 .3 1.0				1,8,13 1,2,4,6, 7 8,9, 11,13,14, 16,17,19	

* The subcolumns are as follows:

C-operator/crew
O-organizational
F-direct support
H-general support
D-depot

** Worktime is included in DMWR

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
	Motor and Valve Assembly (11784520-1)	Inspect		.1				1,2,3, 8,10,13, 14,17	
		Replace		2.0					
		Repair					**		
010507	Electronic Control Unit (11784504)	Inspect		.1				12,18	
		Replace		.2					
		Repair			2.0		**	2,4,5,7,9 10,11,13, 19,21,22,	
	Battery Test Card (11784531)	Inspect			.1			4,10,21	
		Replace			.5				
		Repair					**		
	Circuit Card Assembly, Logic (11784523)	Inspect			.1			4,21	
		Replace			.5				
		Repair					**		
	Circuit Card Assembly, Amplifier (11784526)	Inspect			.1			4,21	
		Replace			.5				
		Repair					**		
02	Transmitter with Battery and Selector (11784700)	Inspect		.1				4,6,15	
		Service		.2					
		Replace		.1					
		Repair					**		

* The subcolumns are as follows:

C-operator/crew
O-organizational
F-direct support
H-general support
D-depot

** Worktime is included in DMWR

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
0201	Transmitter, OCD (11784701)	Inspect		.1				4,6	
		Service		.2					
		Replace		.1					
		Repair		.5			**		
	Bottom Plate Assembly (11784706)	Inspect		.1				14,16	
		Replace		.1					
		Repair		.3			**		
020101	Panel Assembly	Inspect					**		
		Replace					**		
		Repair					**		
02010101	Panel Subassembly	Inspect					**		
		Replace					**		
		Repair					**		
0201010101	Panel	Inspect					**		
		Replace					**		
		Repair					**		
0202	Battery Charger (11784430)	Inspect		.1				4,6,7,9, 10,11,14, 24	
		Replace		.1					
		Repair				.5			

* The subcolumns are as follows:

C-operator/crew
O-organizational
F-direct support
H-general support
D-depot

** Worktime is included in DMWR

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS

(Target Holding Mechanism, Tank Gunnery)

TOOL AND TEST EQUIPMENT REQUIREMENTS				
Tool or Test Equipment Reference Code	Maintenance Category	Nomenclature	National/NATO Stock Number	Tool Number
1	0	Key Set, Socket Head Screw	5120-00-935-4641	
2	0	Pliers, Long Nose: 6 inch	5120-00-247-5177	
3	0	Pliers, Slip Joint	5120-00-223-7397	
4	0	Screwdriver, Cross Tip: Phillips No. 2	5120-00-227-7293	
5	0	Screwdriver, Flat Tip: 5 inch blade	5120-00-278-1270	
6	0	Screwdriver, Flat Tip: 6 inch blade	5120-00-278-1283	
7	0	Soldering Iron, Electric	3439-00-346-7538	
8	0	Wrench Set, BX/0	5120-00-148-7917	
9	0	Tool Crimping	5120-00-278-2423	
10	0	Wrench Set, Socket 1/4 inch	5120-00-081-2305	
11	0	Pliers, Diagonal Cutting: 4-1/2 inch	5110-00-240-6209	
12	0	Wrench Set, Spanner 4-1/2 inch	5120-00-658-9805	
13	0	Wrench Set, Socket 3/8 inch	5120-00-322-6231	
14	0	Knife, Pocket	5110-00-240-5943	

(Target Holding Mechanism, Tank Gunnery) - Continued

TOOL AND TEST EQUIPMENT REQUIREMENTS

Tool or Test Equipment Reference Code	Maintenance Category	Nomenclature	National/NATO Stock Number	Tool Number
15	0	Flashlight	6230-00-161-6422	
16	0	Knife, Putty	5120-00-294-4605	
17	0	Wrench, Set, BX/OE	5120-00-895-9566	
18	0	Screwdriver, Flat Tip 10-inch blade	5120-00-293-3309	
19	0	Wire Strippers		
20	0	Adjustable Wrench		
21	0	Screwdriver, Cross Tip: Phillips No. 1, 3-inch blade	5120-00-240-8716	
22	0	Multimeter	6625-00-578-5849	
23	0	Center Punch	5120-00-237-4956	
24	0	Wrench Set, BX/OE Metric	5120-00-906-0168	
25	0	Screwdriver, Cross Tip: Phillips No. 2, 1 1/2 inch blade	5120-00-227-7293	
26	0	Insertion and Removal Tool	5120-00-169-2960	

APPENDIX C

ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST INCLUDING DEPOT MAINTENANCE REPAIR PARTS

Section I. INTRODUCTION

C-1. SCOPE. This appendix (RPSTL) lists spares and repair parts; special tools, special test, measurement, and diagnostic equipment (TMDE); and other special support equipment required for performance of organizational, direct support, and general support maintenance of the Target Holding Mechanism/Tank Gunnery. It authorizes the requisitioning and issue of spares and repair parts as indicated by the source maintenance and recoverability (SMR) codes.

C-2. GENERAL. In addition to Section I, Introduction, this Repair Parts and Special Tools List is divided into the following sections:

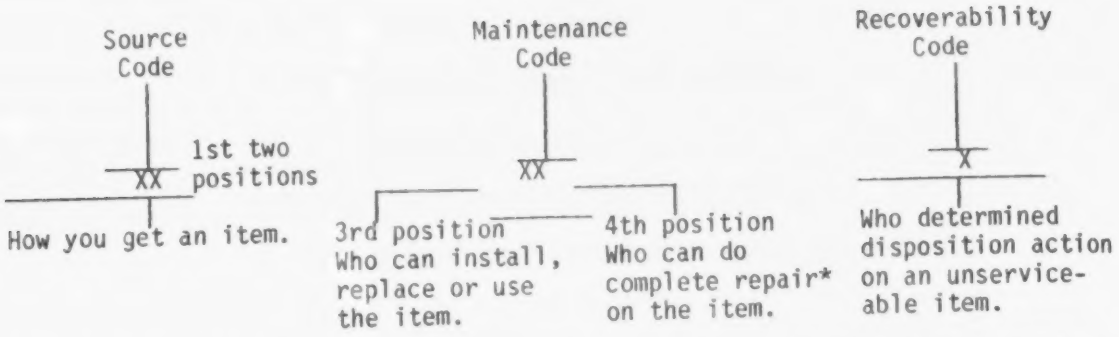
a. Section II, Repair Parts List. A list of repair parts authorized for use in the performance of maintenance. This list also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending numerical sequence, with the parts in each group listed in figure and item number sequence. Bulk materials are listed in NSN sequence, as the last group in Section II. Repair parts for reparable special tools are not addressed because there are no special tools applicable to this RPSTL. Items listed are shown on the associated illustrations/figures.

b. Section III, Special Tools List. Special tools are not applicable to the RPSTL.

C-3. EXPLANATION OF COLUMNS. (Sections II and III)

a. Item Number (Column (1)). Indicates the number used to identify items called out in each associated illustration.

b. SMR Code (Column (2)). The Source, Maintenance, and Recoverability (SMR) code is a 5-position code containing supply/requisitioning information, maintenance category authorization criteria, and disposition instruction, as shown in the following breakout:


Source Code
1st two positions
XX
How you get an item.
Maintenance Code
XX
3rd position Who can install, replace or use the item.
4th position Who can do complete repair* on the item.
Recoverability Code
X
Who determined disposition action on an unserviceable item.

*Complete Repair: Maintenance capacity, capability, and authority to perform all corrective maintenance tasks of the "Repair" function in a use/user environment in order to restore serviceability to a failed item.

(1) Source Code. The source code tells how to get an item needed for maintenance, repair, or overhaul of an end item/equipment. Explanations of source codes follows:

Code	Explanation
PA PB PC** PD PE PF PG	Stocked items: use the applicable NSN to request/ requisition items with this source code. They are authorized to the category indicated by the code entered in the 3rd position of the SMR code. **NOTE: Items coded PC are subject to deterioration.
KD KF KB	Items with these codes are not to be requested/ requisitioned individually. They are part of a kit which is authorized to the maintenance category indicated in the 3rd position of the SMR code. The complete kit must be requisitioned and applied. (Kits are not applicable to this RPSTL.)
MO- (Made at Org/ AVUM Level) MF- (Made at DS/ AVUM Level) MH- (Made at GS Level) ML- (Made at Specialized Repair Act (SRA)) MD- (Made at Depot)	Items with these codes are not to be requested/ requisitioned individually. They must be made from bulk material which is identified by the NSN sequence listing of Section II in the last group. If the item is authorized by the 3rd position code of the SMR code, but the source code indicates it is made at a higher level, order the item from the higher level of maintenance.

AO- (Assembled by ORG/AVUM Level)
AF- (Assembled by DS/AVIM Level)
AH- (Assembled by GS category)
AL- (Assembled by SRA)
AD- (Assembled by Depot)

Items with these codes are not to be requested/ requisitioned individually. The parts that make up the assembled item must be requisitioned or fabricated and assembled at the level of maintenance indicated by the source code. If the 3rd position code of the SMR code authorizes you to replace the item, but the source code indicates the item is assembled at a higher level, order the item from the higher level.

XA - Do not requisition an "XA" -coded item. Order its next higher assembly. (Also, refer to the NOTE below.)

XB - If an "XB" item is not available from salvage, order it using the FSCM and part number given.

XC - Installation drawing, diagram, instruction sheet, field service drawing, that is identified by manufacturer's part number.

XD - Item is not stocked. Order an "XD" -coded item through normal supply channels using the FSCM and part number given, if no NSN is available.

NOTE: Cannibalization or controlled exchange, when authorized, may be used as a source of supply for items with the above source codes, except for those source coded "XA".

(2) Maintenance Code. Maintenance codes tell you the level(s) of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the SMR code as follows:

(a) The maintenance code entered in the third position specifies the lowest maintenance level authorized to remove, replace, and use an item. The maintenance code entered in the third position will indicate authorization to one of the following levels of maintenance.

Code	Application/Explanation
C	- Crew or operator maintenance done within organizational or unit maintenance.
O	- Organizational or unit category can remove, replace and use the item.
F	- Direct support or intermediate level can remove, replace, and use the item.
H	- General support level can remove, replace, and use the item.

L - Specialized repair activity can remove, replace, and use the item. (Not applicable to this RPSTL.)

D - Depot level can remove, replace, and use the item.

(b) The maintenance code entered in the fourth position specifies whether or not the item is to be repaired and identifies the lowest maintenance level with the capability to do complete repair (i.e., perform all authorized repair functions). This position will contain one of the following maintenance codes.

Code	Application/Explanation
O	- Organizational unit is the lowest level that can do complete repair of the item.
F	- Direct support or intermediate is the lowest level that can do complete repair of the item.
H	- General support is the lowest level that can do complete repair of the item.
L	- Specialized repair activity is the lowest level that can do complete repair of the item. (Not applicable to this RPSTL.)
D	- Depot is the lowest level that can do complete repair of the item.
Z	- No repair is authorized. (No parts or special tools are authorized for the maintenance of a "B" coded item.) However, the item may be reconditioned by adjusting, lubricating, etc., at the user level.

(3) Recoverability Code. Recoverability codes are assigned to items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the SMR Code as follows:

Recoverability Codes	Application/Explanation
Z	- Nonreparable item. When unserviceable, condemn and dispose of the item at the level of maintenance shown in 3rd position of SMR code.
O	- Reparable item. When uneconomically reparable, condemn and dispose of the item at the organizational level.
F	- Reparable item. When uneconomically reparable, condemn and dispose of the item at the direct support level.

H - Reparable item. When uneconomically reparable, condemn and dispose of the item at the general support level.

D - Reparable item. When beyond lower level repair capability, return to depot. Condemnation and disposal of item not authorized below depot level.

L - Reparable item. Condemnation and disposal not authorized below specialized repair activity (SRA). (Not applicable to this RPSTL.)

A - Item requires special handling or condemnation procedures because of specific reasons (e.g., precious metal content, high dollar value, critical material, or hazardous material). Refer to appropriate manuals/ directives for specific instructions.

c. FSCM (Column (3)). The Federal Supply Code for Manufacturer (FSCM) is a 5-digit numeric code which is used to identify the manufacturer, distributor, or government agency, etc., that supplies the item.

d. PART NUMBER (Column (4)). Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements to identify an item or range of items.

NOTE: When using an NSN to requisition an item, the item received may have a different part number from the part ordered.

e. DESCRIPTION AND USABLE ON CODE (UOC) (Column (5)). This column includes the following information:

NOTE: The Usable On Code (UOC) is not applicable to this RPSTL.

(1) The Federal item name and, when required, a minimum description to identify the item.

(2) The physical security classification. Not applicable.

(3) Kits and sets. Not applicable.

(4) Spare/repair parts that make up an assembled item are listed immediately following the assembled item line entry.

(5) Part numbers for bulk materials are referenced in this column in the line item entry for the item to be manufactured/fabricated.

(6) When the item is not used with all serial numbers of the same model, the effective serial numbers are shown on the last line(s) of the description. Not applicable to this RPSTL.

(7) The statement "END OF FIGURE" appears just below the last item description in Column 5 for a given figure in both Section II and Section III.

f. QTY (Column (6)). The QTY (quantity - figure column) indicates the quantity of the item used in the breakout shown on the illustration figure, which is prepared for a functional group, subfunctional group, or an assembly. A "V" appearing in this column in lieu of a quantity indicates that the quantity is variable and the quantity may vary from application to application.

g. Unit of Measure (U/M). Indicates the standard of the basic quantity of the listed item as used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea., in., pr., etc.). When the unit of measure differs from the unit of issue, the lowest unit of issue that will satisfy the required units of measure will be requisitioned.

C-4. EXPLANATION OF COLUMNS (SEC. IV).

a. NATIONAL STOCK NUMBER (NSN) INDEX.

(1) STOCK NUMBER column. This column lists the NSN by National item identification number (NIIN) sequence. The NIIN consists of the last nine digits of the NSN (i.e., NSN 5305-01-674-1465). When using this column to locate an item, ignore the first 4 digits of the NSN. However, the complete NSN should be used when ordering items by stock number.

(2) FIG. column. This column lists the number of the figure where the item is identified/located. The figures are in numerical order in Section II and Section III.

(3) ITEM column. The item number identifies the item associated with the figure listed in the adjacent FIG. column. This item is also identified by the NSN listed on the same line.

b. PART NUMBER INDEX. Part numbers in this index are listed by part number in ascending alphanumeric sequence. That is, vertical arrangement of letter and number combination which places the first letter or digit of each group in order A through Z, followed by the numbers 0 through 9 and each following letter or digit in like order.

(1) FSCM column. The Federal Supply Code for Manufacturer (FSCM) is a 5-digit numeric code used to identify the manufacturer, distributor, or government agency, etc., that supplies the item.

(2) PART NUMBER column. Indicates the primary number used by the manufacturer (individual, firm, corporation, or government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements to identify an item or range of items.

(3) STOCK NUMBER column. This column lists the NSN for the associated part number and manufacturer identified in the PART NUMBER and FSCM columns to the left.

(4) FIG. column. This column lists the number of the figure where the item is identified/located in Section II and III.

(5) ITEM column. The item number is that number assigned to the item as it appears in the figure referenced in the adjacent figure number column.

C-5. SPECIAL INFORMATION

a. FABRICATION INSTRUCTIONS. Bulk materials required to manufacture items are listed in the Bulk Material Functional Group of the RPSTL. Part numbers for bulk materials are also referenced in the description column of the line item entry for the item to be manufactured/fabricated. Detailed fabrication instructions for items source codes to be manufactured or fabricated are found in Chapter 5, Section III, General Maintenance of this manual.

b. INDEX NUMBERS. Items which have the work bulk in the figure column will have an index number shown in the item number column. This index number is a cross-reference between the National Stock Number/Part Number Index and the bulk material list in Section II.

C-6. HOW TO LOCATE REPAIR PARTS

a. When National Stock Number or Part Number is not known.

(1) First. Using the table of contents, determine the assembly group or subassembly group to which the item belongs. This is necessary since figures are prepared for assembly groups and subassembly groups, and listings are divided into the same groups.

(2) Second. Find the figure covering the assembly group or subassembly group to which the item belongs.

(3) Third. Identify the item on the figure and note the item number.

(4) Fourth. Refer to the Repair Parts List for the figure to find the part number for the item number noted on the figure.

(5) Fifth. Refer to the Part Number Index to find the NSN, if assigned.

b. When National Stock Number or Part Number is known.

(1) First. Using the Index of National Stock Numbers and Part Numbers, find the pertinent National Stock Number or Part Number. The NSN index is in National Item Identification Number (NIIN) sequence. (See 4.1,(1).)

The part numbers in the Part Number index are listed in ascending alphanumeric sequence (see 4.b). Both indexes cross-reference to the illustration figure and item number of the item sought.

(2) Second. After finding the figure and item number, verify that the item is the one sought, then locate the item number in the repair parts list for the figure.

C-7. ABBREVIATIONS. Not applicable.

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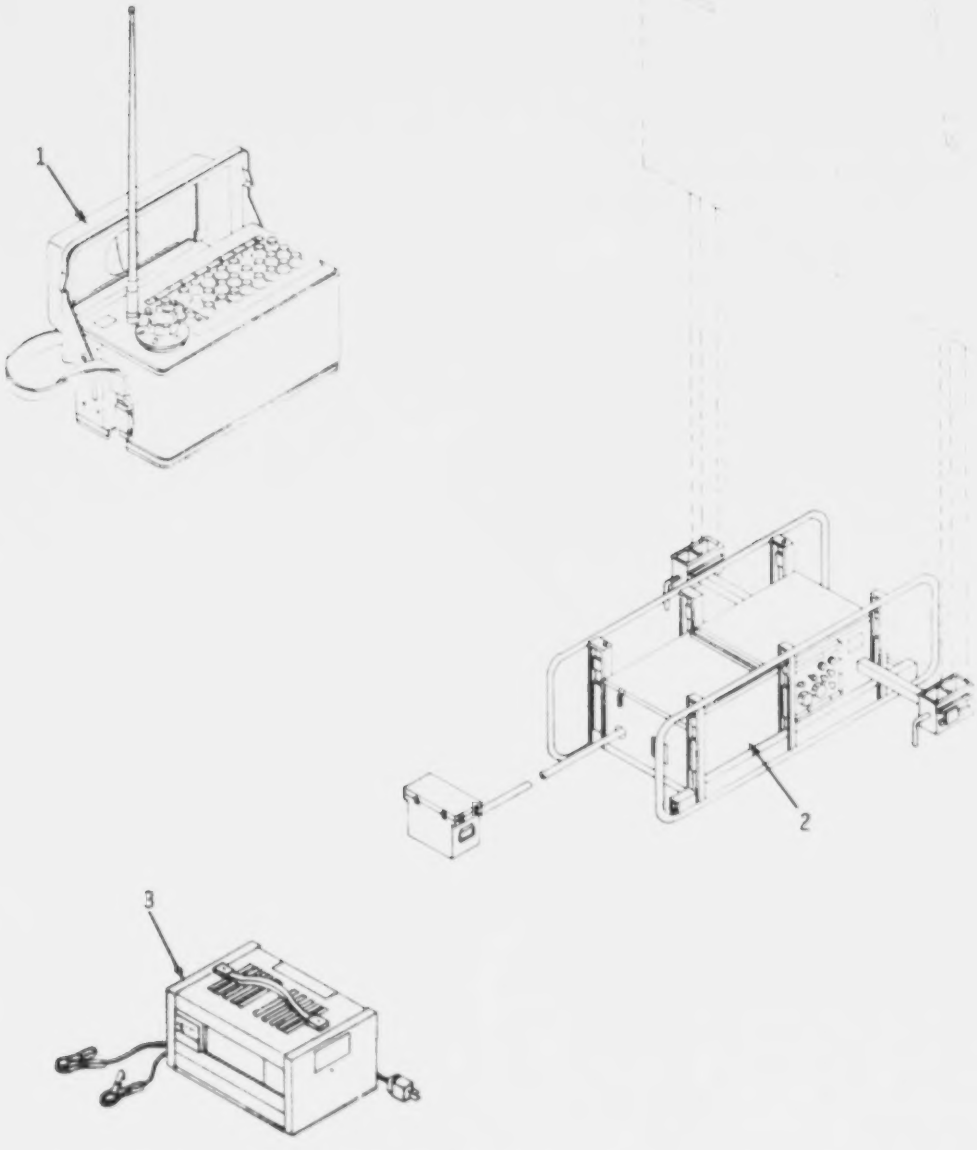

Figure C1. Target Holding Mechanism/
Tank Gunnery (11874500) (Group 00)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				TARGET HOLDING MECHANISM	
				GROUP 00	
1	PAODD	19200	11784700	TRANSMITTER, WITH BATTERY	1
2	PFODD	19200	11784501	AUTOMATIC TANK TARGET RADIO CONTROLLED SEE FIGURE C2, SHEET 1, FOR COMPONENT PARTS	1
2	PFODD	19200	9375764	AUTOMATIC TANK TARGET COMPUTER CONTROLLED SEE FIGURE C2, SHEET 2FOR COMPONENT PARTS	1
3	PAOZZ	19200	11784485	CHARGER, BATTERY	1

END OF FIGURE

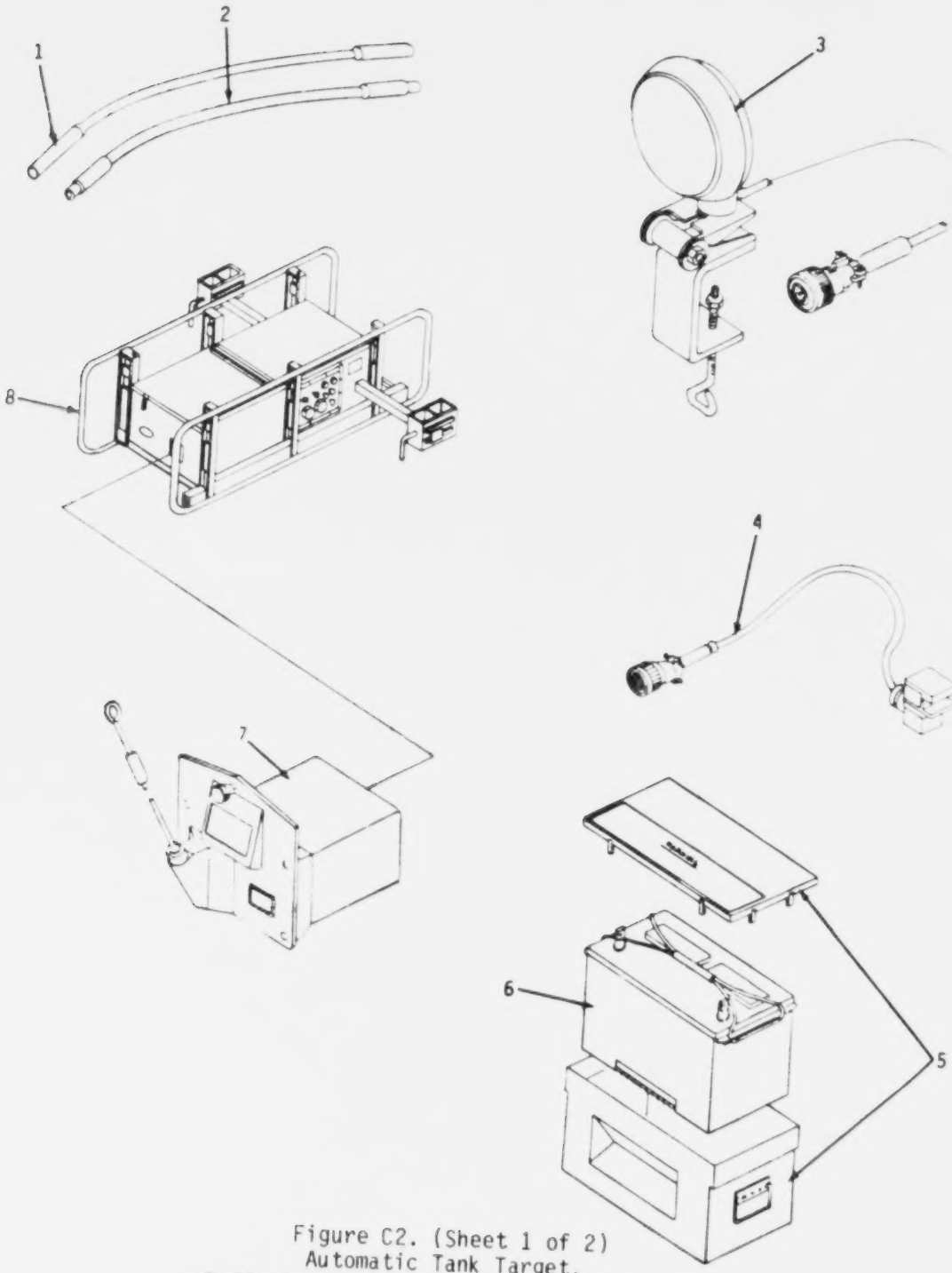

Figure C2. (Sheet 1 of 2)
Automatic Tank Target,
Radio Controlled (11784501) (Group 01)

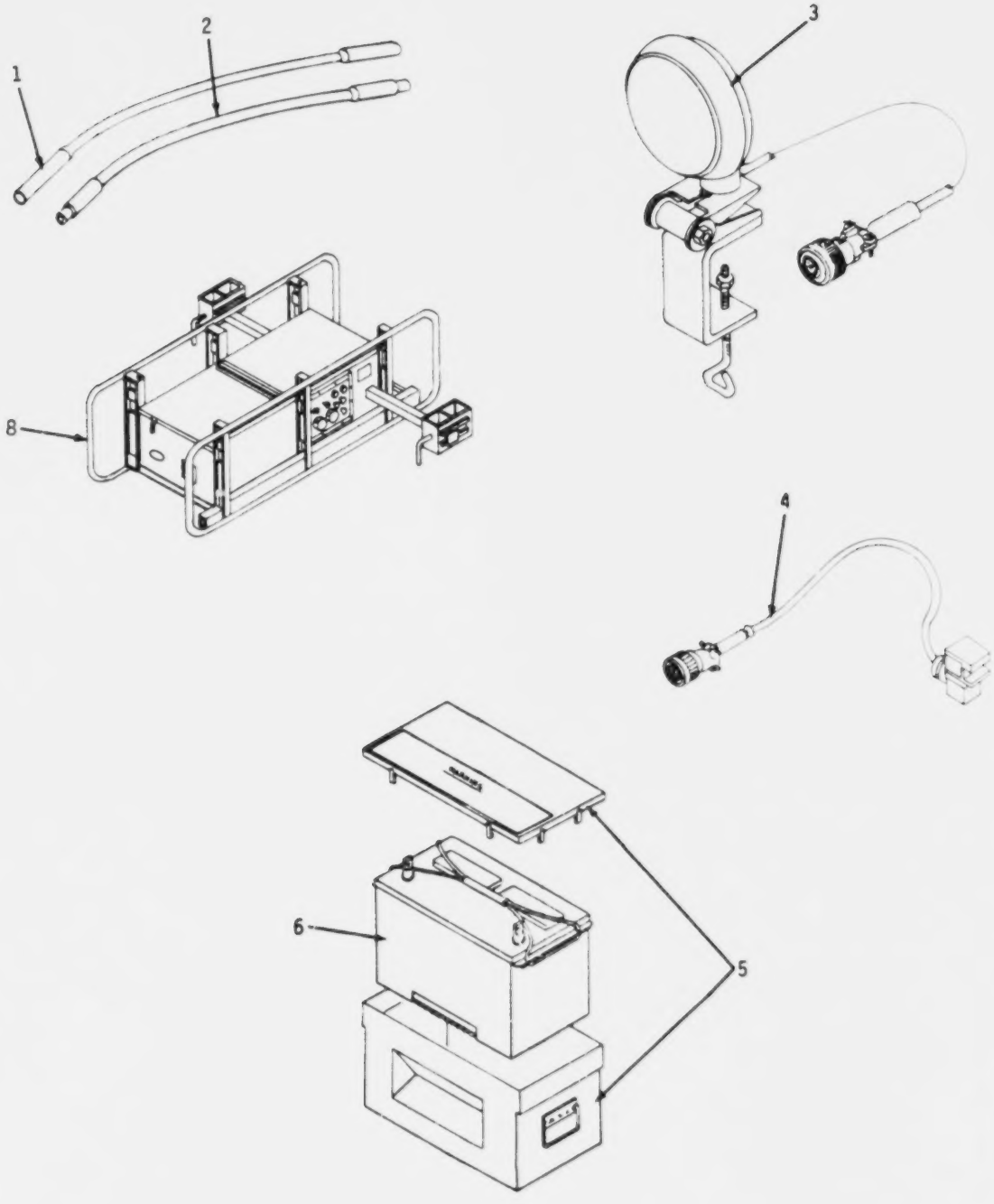

Figure C2. (Sheet 2 of 2)
Automatic Tank Target,
Computer Controlled (9375764) (Group 01)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				AUTOMATIC TANK TARGET	
				GROUP 01	
1	PA0ZZ	19200	9375734	CABLE,POWER,ELECTRI NEGATIVE	1
2	PA0ZZ	19200	9375737	CABLE,POWER,ELECTRI POSITIVE	1
3	PA000	19200	11784475	LAMP ASSEMBLY SEE FIGURE C3 FOR COMPONENT PARTS	1
4	PA0FF	19200	11784450	SENSOR,HIT SEE FIGURE C8 FOR COMPONENT PARTS	3
5	PA000	19200	9375756	BOX,BATTERY ASSEMBLY SEE FIGURE C4 FOR COMPONENT PARTS	1
6	PA0ZZ	19200	11784484	BATTERY,12 VOLT	1
7	PA0DD	19200	11784801	RECEIVER,CHANNEL SEE FIGURE C5 FOR COMPONENT PARTS	1
8	PA0FD	19200	11784502	TANK TARGET ASSEMBL ASSEMBLY SEE FIGURE C10 FOR COMPONENT PARTS	1

END OF FIGURE

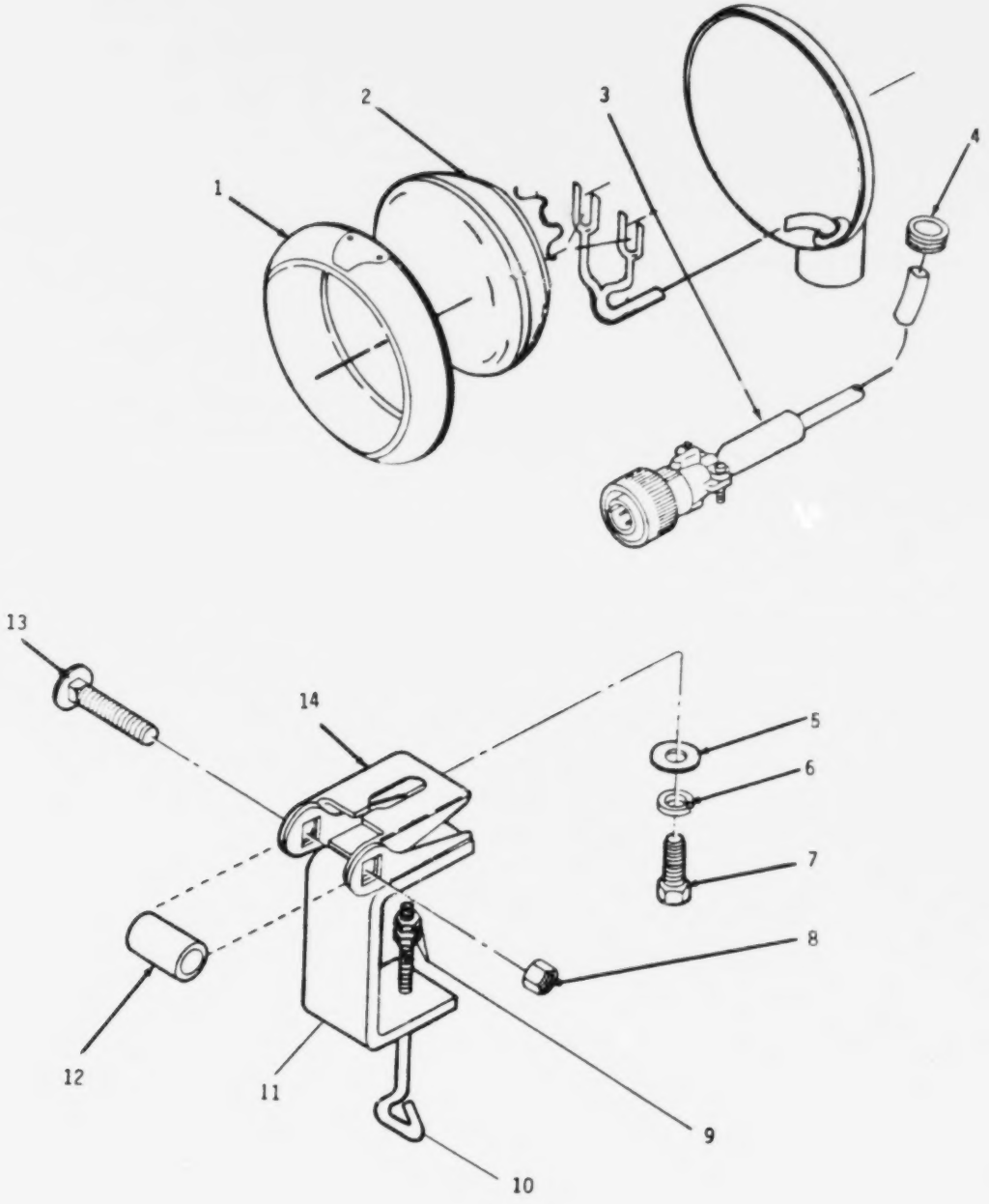

Figure C3. Lamp Assembly (VHIL) (11784475) (Group 0101)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				LAMP ASSEMBLY	
				GROUP 0101	
1	XAOZZ	19200	11784480	HOUSING	1
2	PAOZZ	19200	11784473	LAMP,HALOGEN	1
3	PAOZZ	19200	11784476	CABLE ASSEMBLY,SPEC	1
4	PAOZZ	96906	MS35489-35	GROMMET,NONMETALLIC	1
5	PAOZZ	96906	MS27183-16	WASHER,FLAT	1
6	PAOZZ	96906	MS35338-47	WASHER,LOCK	1
7	PAOZZ	96906	MS90728-85	SCREW,CAP,HEXAGON H	1
8	PAOZZ	96906	MS51967-11	NUT,PLAIN,HEXAGON	1
9	PAOZZ	96906	MS35649-2312	NUT,PLAIN,HEXAGON	1
10	PAOZZ	19200	11784482	SCREW,EYE	2
11	PAOZZ	19200	11784477	BRACKET,MOUNTING	1
12	PAOZZ	19200	11784481	SPACER,SLEEVE	1
13	PAOZZ	96906	MS35751-102	BOLT,SQUARE NECK	1
14	PAOZZ	19200	11784483	PLATE	1

END OF FIGURE

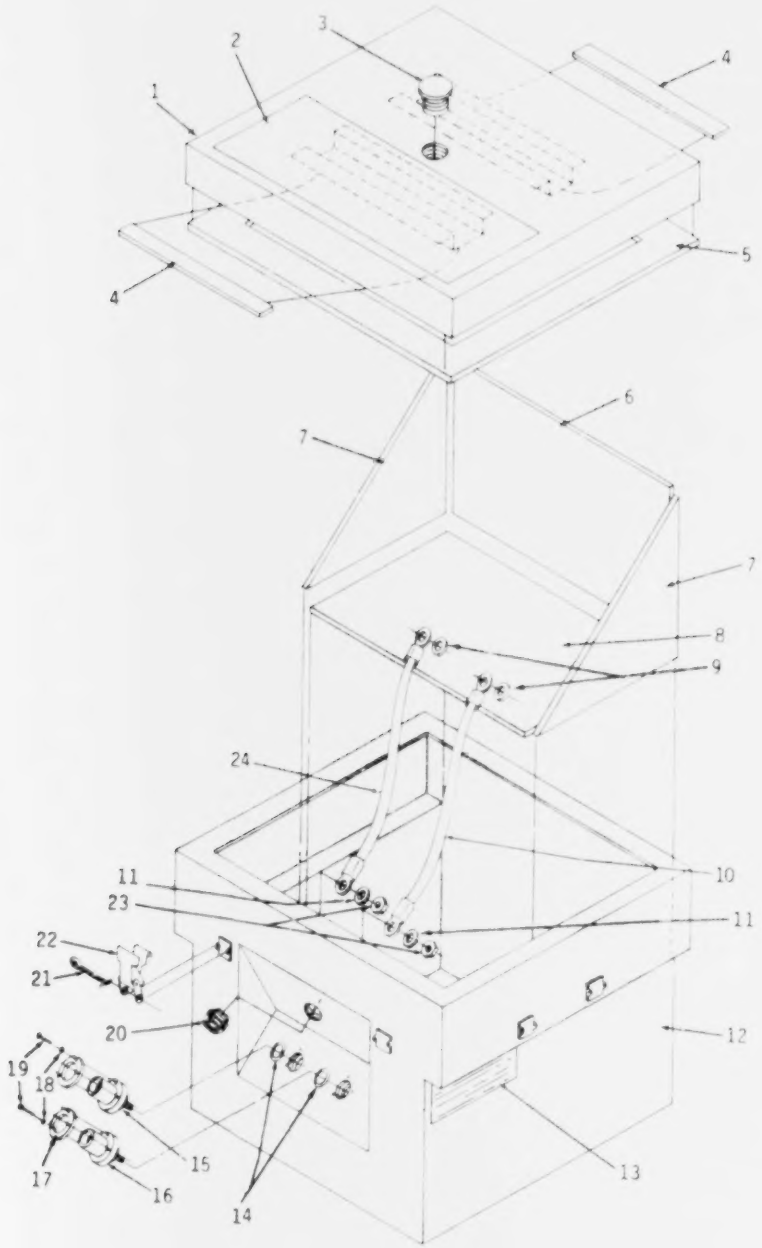

Figure C4. Battery Box Assembly (9375756) (Group 0102)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				BATTERY BOX ASSEMBLY	
				GROUP 0102	
1	XAOZZ	19200	9375739	LID ASSEMBLY, BATTERY BOX	1
2	PAOZZ	19200	9375741	SIGN,WARNING, BATTERY BOX	1
3	PAOZZ	19200	11784645	PLUG,MACHINE THREAD	1
4	PAOZZ	19200	9375733	STRIP	2
5	PAOZZ	19200	9375724	GASKET	1
6	PAOZZ	19200	9375723	PAD,BACK	1
7	PAOZZ	19200	9375721	PAD,SIDE	2
8	PAOZZ	19200	9375722	PAD,BOTTOM	1
9	PAOZZ	96906	MS35338-45	WASHER,LOCK	2
10	PAOZZ	19200	11784512	CABLE,BATTERY BLACK	1
11	PAOZZ	96906	MS35333-75	WASHER,LOCK	2
12	XAOZZ	19200	9375738	BOX,BATTERY, WELDED	1
13	PAOZZ	19200	9375728	SIGN,SERIAL NUMBER	1
14	PAOZZ	96906	MS28775-020	PACKING,PREFORMED	2
15	PAOZZ	19200	9375717	RECEPTACLE,CABLE, RED	1
16	PAOZZ	19200	9375718	RECEPTACLE,CABLE, BLACK	1
17	PAOZZ	19200	9375729	WASHER,FLAT RECEPTACLE	2
18	PAOZZ	96906	MS35338-42	WASHER,LOCK	6
19	PAOZZ	96906	MS35206-246	SCREW,MACHINE	6
20	PAOZZ	19200	9375765	VALVE,BREATHER	1
21	PAOZZ	19200	9375755-3	PIN,COTTER	8
22	PAOZZ	19200	9375755-1	CATCH,CLAMPING	8
23	PAOZZ	96906	MS51967-5	NUT,PLAIN,HEXAGON	2
24	PAOZZ	19200	11784513	CABLE,BATTERY, RED	1

END OF FIGURE

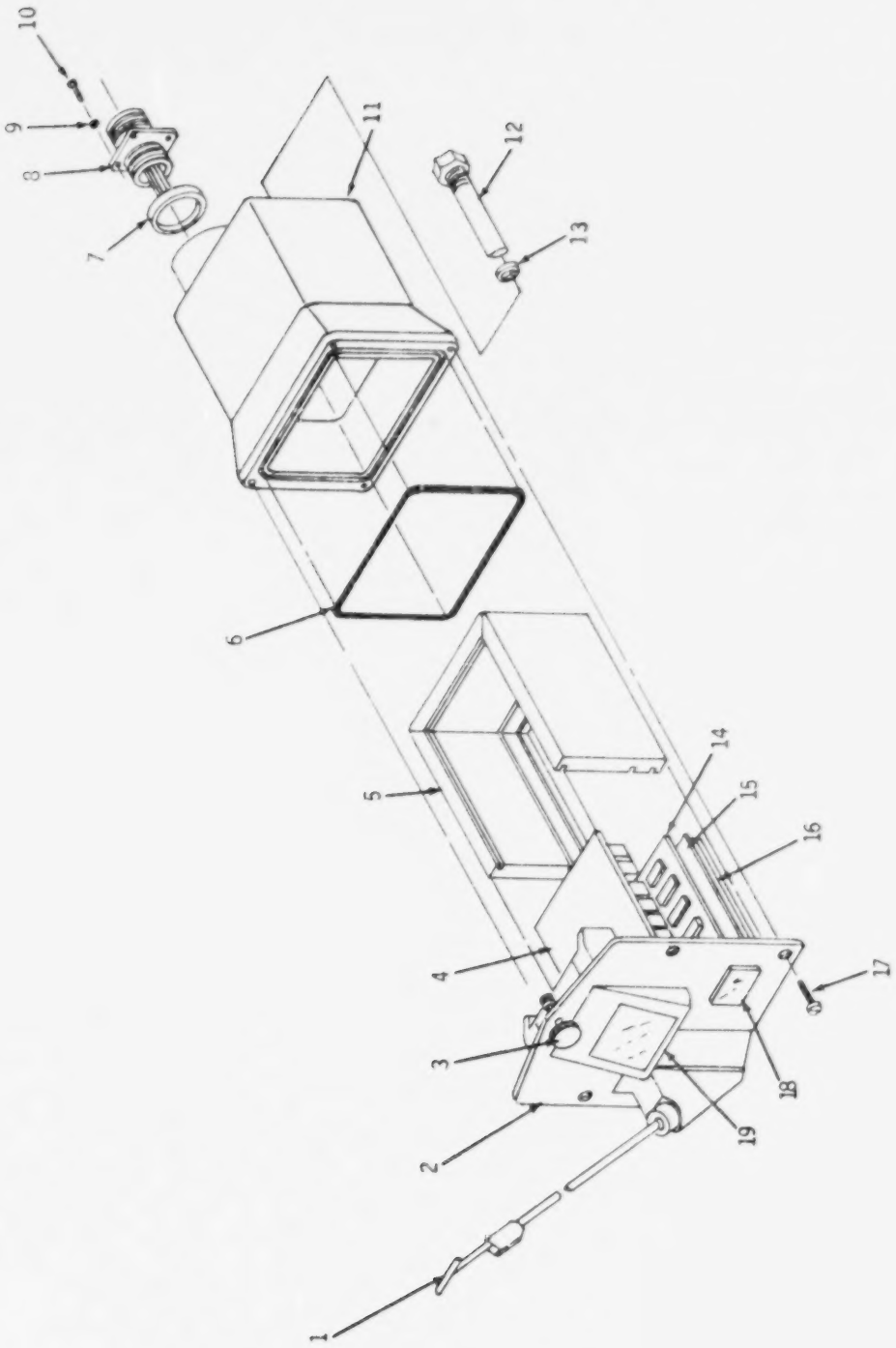

Figure C5. Receiver (11784801) (Group 0301)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				RECEIVER	
				GROUP 0103	
1	PAOZZ	19200	11784802	ANTENNA	1
2	PADDD	19200	11784804	PANEL,CONTROL SEE FIGURE C6 FOR COMPONENT PARTS	1
3	PAOZZ	19200	11784837	SCREW,MOUNTING	1
4	PADDD	19200	11784814	CIRCUIT CARD ASSEMBLY	1
5	PADZZ	19200	11784817	HOLDER,ELECTRICAL C	1
6	PADZZ	19200	11784849-6	PACKING,PREFORMED	1
7	PADZZ	96906	MS28775-020	PACKING,PREFORMED	1
8	PADDD	19200	9375750	CABLE ASSEMBLY,SPEC SEE FIGURE C7 FOR COMPONENT PARTS	1
9	PADZZ	96906	MS35338-40	WASHER,LOCK	4
10	PADZZ	96906	MS35206-215	SCREW,MACHINE	4
11	PADZZ	19200	9375742	COVER,RECEIVER ASSEMBLY	1
12	PAOZZ	19200	11784803	DESICCATOR ASSEMBLY	1
13	PADZZ	96906	MS35489-35	GROMMET,NONMETALLIC	1
14	PADDD	19200	11784808	CIRCUIT CARD ASSEMB ASSEMBLY	1
15	PADDD	19200	11784811	CIRCUIT CARD ASSEMB ASSEMBLY	1
16	PADZZ	19200	9375725	PAD,PROTECTION	1
17	PADZZ	19200	11784575	SCREW,MACHINE	4
18	XDDZZ	19200	11784443	SIGN	1
19	XDDZZ	19200	11784442	SIGN	1

END OF FIGURE

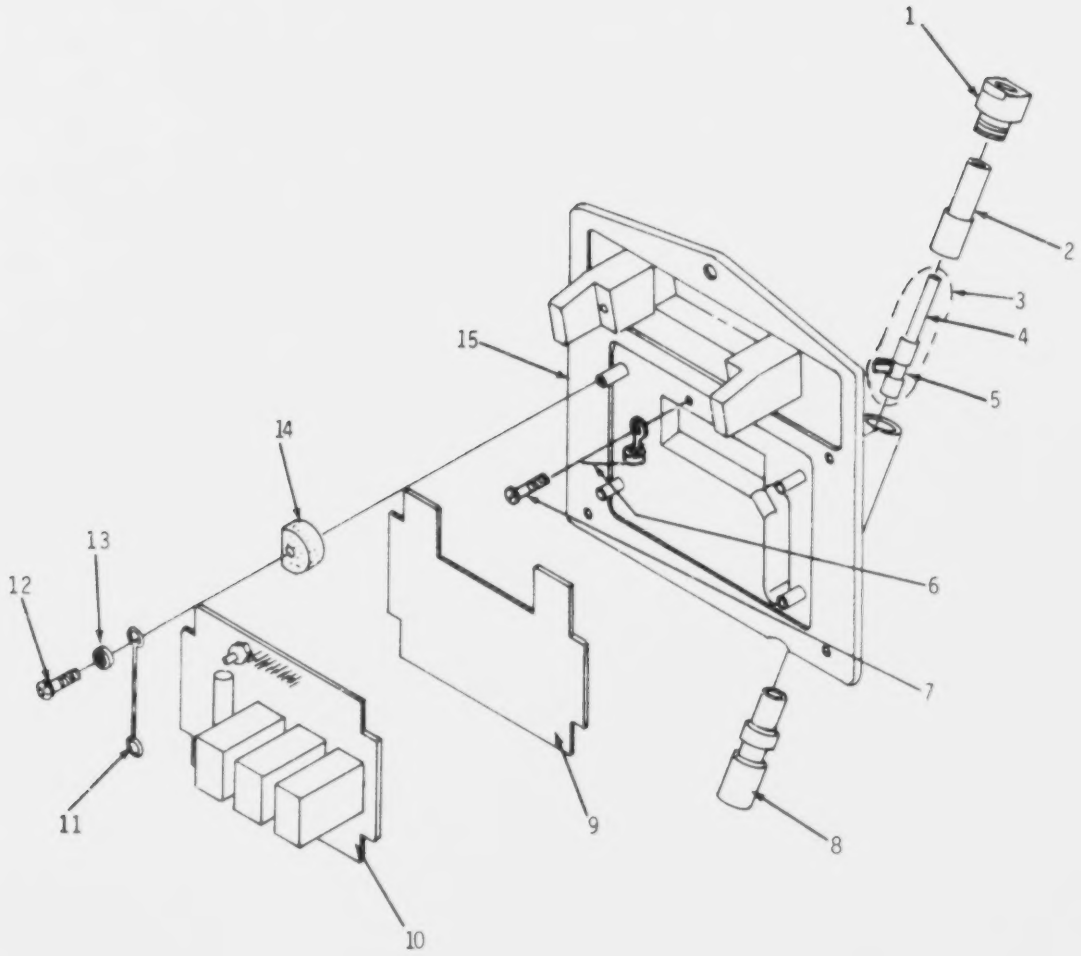

Figure C6. Panel Assembly, Receiver (11784804) (Group 010301)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				RECEIVER PANEL	
				GROUP 010301	
1	PADZZ	19200	11784824	HOUSING	1
2	PADZZ	19200	11784823	INSULATING HOUSING, UPPER	1
3	PADDD	19200	11784820	HOUSING,ANTENNA	1
4	PADZZ	19200	11784828	.SOCKET	1
5	PADZZ	19200	11784829	.SPACER,RING	1
6	PADZZ	19200	11784819	CABLE,COAXIAL	1
7	PADZZ	19200	11784577	SCREW,MACHINE	1
8	PADZZ	19200	11784822	INSULATING,HOUSING, LOWER	1
9	XDDZZ	19200	11784825	PLATE,INSULATING	1
10	PADDD	19200	11784805	CIRCUIT CARD ASSEMB ASSEMBLY	1
11	PADZZ	19200	11784821	CONNECTING LINK,RIG	2
12	PADZZ	19200	11784555-1	SCREW,MACHINE	4
13	PADZZ	19200	11784570-1	WASHER,LOCK	4
14	PADZZ	19200	11784826	SPACER	4
15	XADZZ	19200	11784827	PANEL	1

END OF FIGURE

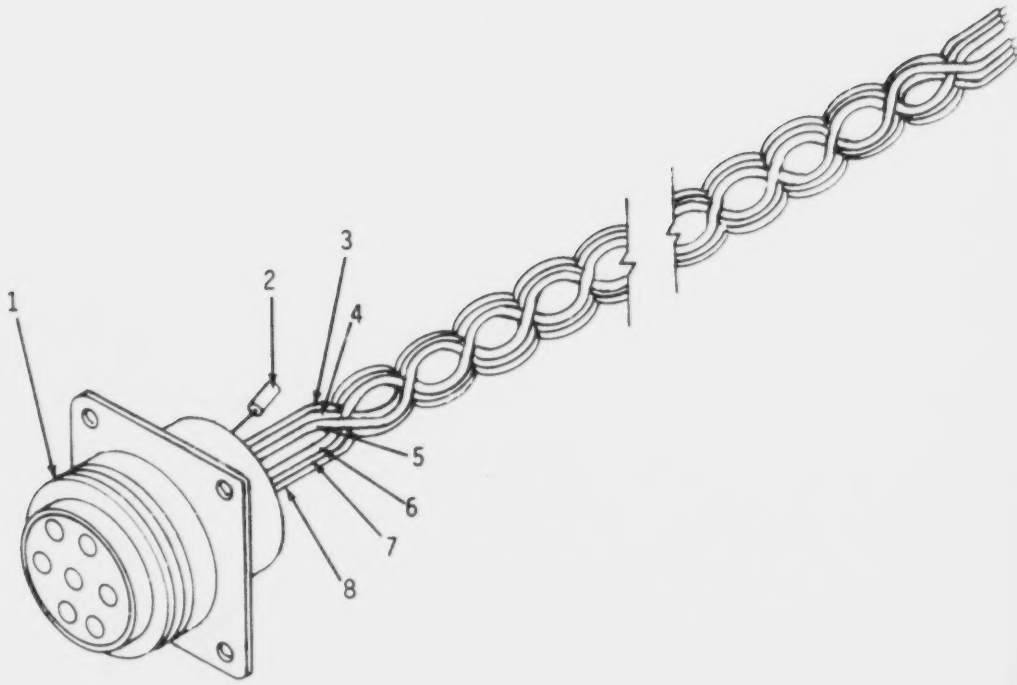

Figure C7. Cable Assembly,
Special Purpose, Electrical (9375750) (Group 010302)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				CABLE ASSEMBLY,SPECIAL PURPOSE	
				GROUP 010302	
1	PAOZZ	96906	MS3452W16S-1S	CONNECTOR,RECEPTACL ELECTRICAL	1
2	PAOZZ	81349	M39014/02-1332	CAPACITOR,FIXED,CER	1
3	PAOZZ	81349	MW-C24/7/U6	WIRE,ELECTRICAL BLUE	V
4	PAOZZ	81349	MW-C24(7)U9	WIRE,ELECTRICAL WHITE	V
5	PAOZZ	81349	M16878/12BEB0	WIRE,ELECTRICAL BLACK	V
6	PAOZZ	81349	M16878/12BEB2	WIRE,ELECTRICAL RED	V
7	PAOZZ	81349	MW-C24(7)U5	WIRE,ELECTRICAL GREEN	V
8	PAOZZ	81349	MW-C24/7/U1	WIRE,ELECTRICAL BROWN	V

END OF FIGURE

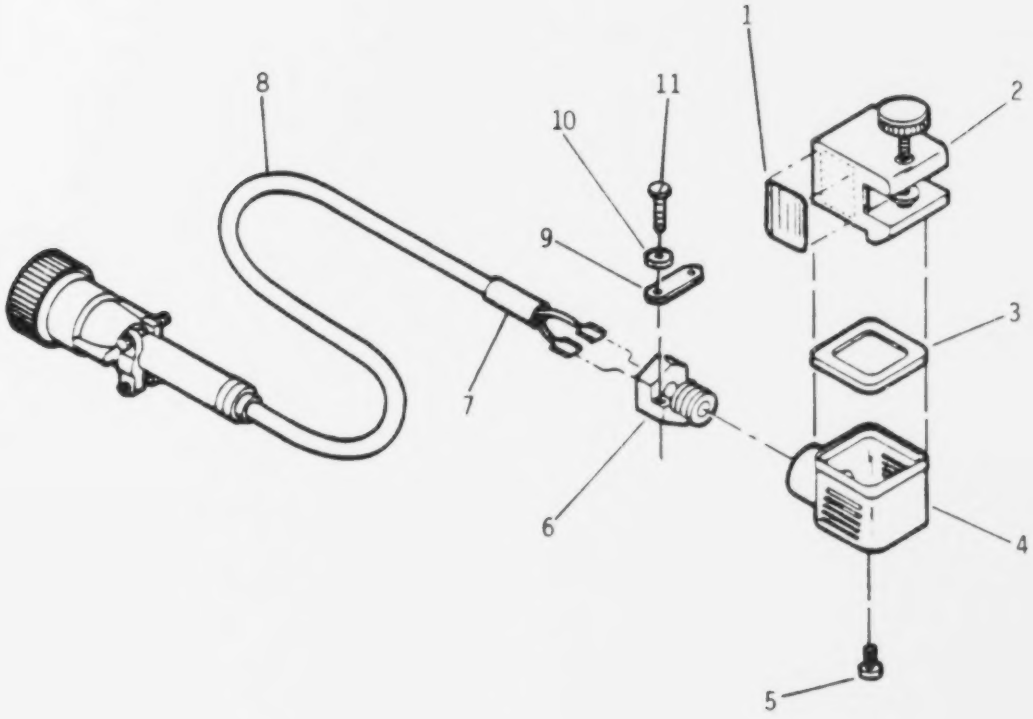

Figure C8. Hit Sensor (11784450) (Group 0104)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				HIT SENSOR	
				GROUP 0104	
1	XDFZZ	19200	11784453	SIGN	
2	PAFZZ	19200	11784451	HEAD,HIT SENSOR	1
3	PAFZZ	19200	11784599	GASKET	1
4	PAFZZ	19200	11784454	COVER,ELECTRICAL CO	1
5	PAFZZ	19200	11784576-2	SCREW,MACHINE	1
6	PAFZZ	19200	11784455	CLAMP,CABLE,ELECTRI	1
7	PAFZZ	81349	M23053/14-005-C	TUBING,SHRINK	1
8	PAFFF	19200	11784452	CABLE ASSEMBLY,SPEC SPECIAL PURPOSE,ELECTRICAL SEE FIGURE C9 FOR COMPONENT PARTS	V 1
9	PAFZZ	19200	11784456	PLATE,CLAMP	1
10	PAFZZ	96906	MS35338-55	WASHER,LOCK	2
11	PAFZZ	96906	MS35206-214	SCREW,MACHINE	2
				END OF FIGURE	

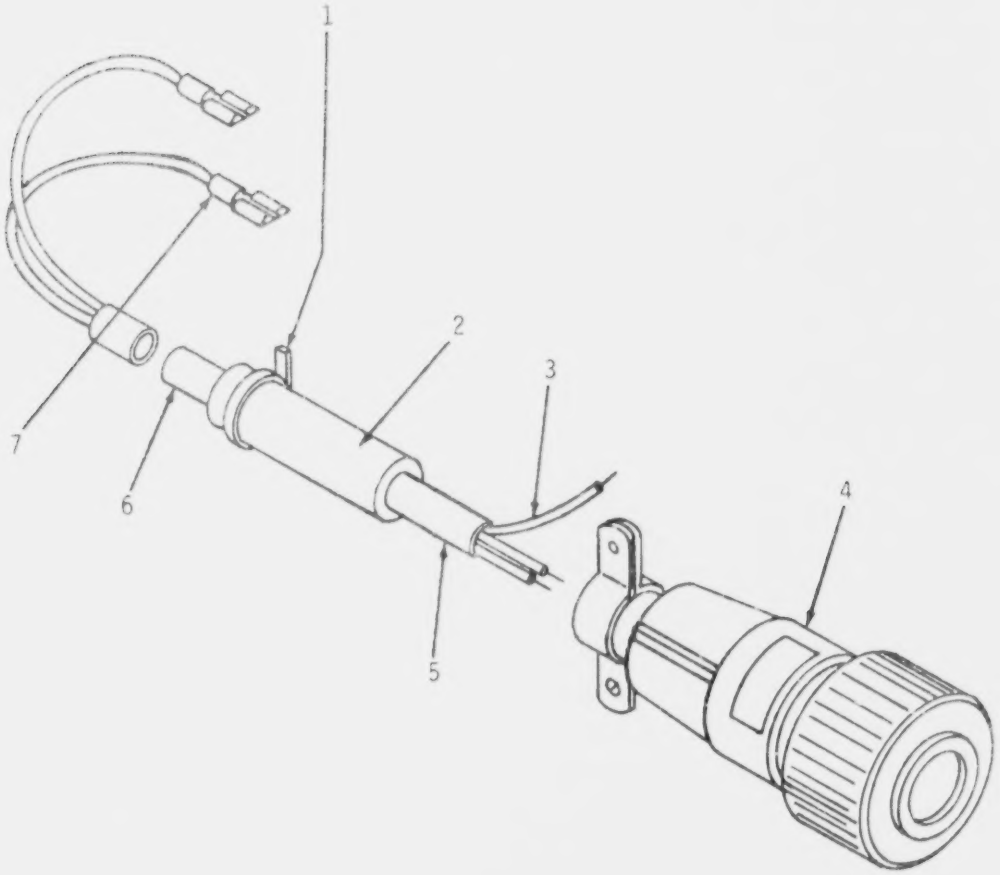

Figure C9. Cable Assembly,
Special Purpose, Electrical (11784452) (Group 010401)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				CABLE ASSEMBLY, SPECIAL PURPOSE ELECTRICAL	
				GROUP 010401	
1	PAFZZ	96906	MS3367-4-9	STRAP, TIEDOWN, ELECT ELECTRICAL	V
2	PAFZZ	96906	MS3420-8	BUSHING, ELECTRICAL	1
3	PAFZZ	81349	M16878/12BFB8	WIRE, ELECTRICAL	V
4	PAFZZ	19200	11784664	CONNECTOR, RECEPTACL ELECTRICAL	1
5	PAFZZ	19200	9375562	CONNECTOR, SHEILD GROUNDING	1
6	PAFZZ	19200	11784560-1	CABLE, SHIELDED	V
7	PAFZZ	19200	11784559-2	TERMINAL, QUICK DISC	2

END OF FIGURE

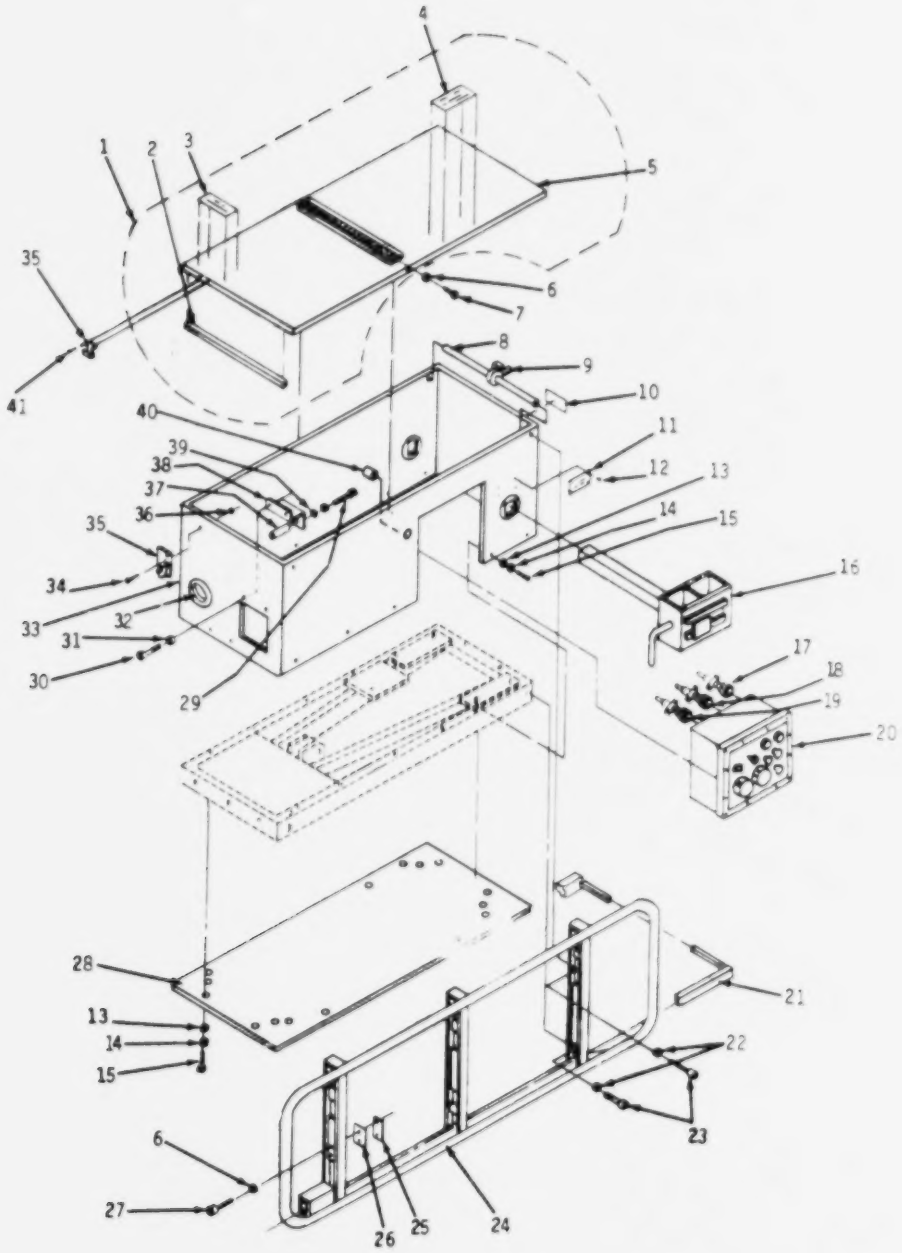

Figure C10. (Sheet 1 of 2)
Tank Target Assembly (11784502) (Group 0105)

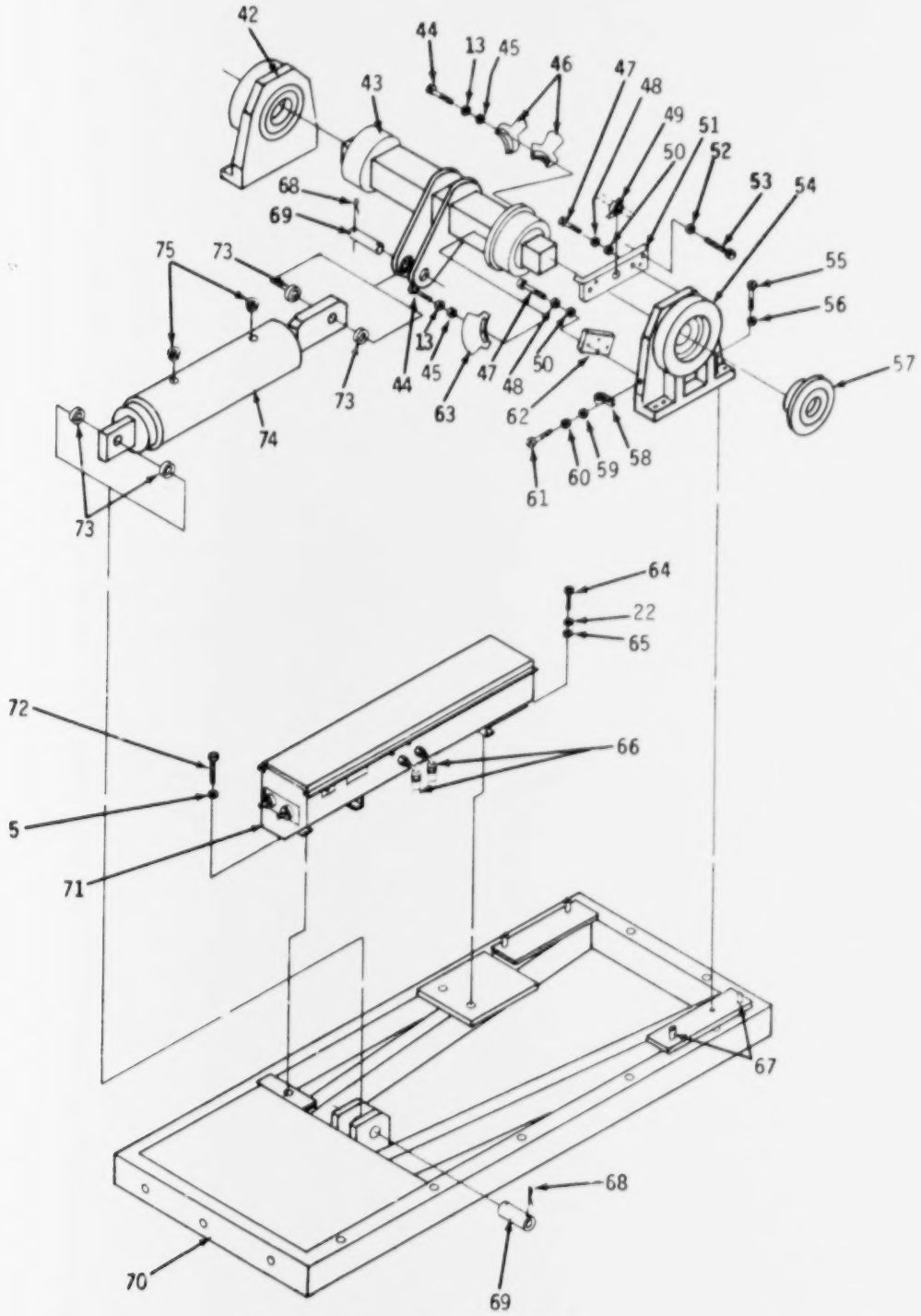

Figure C10. (Sheet 2 of 2)
Tank Target Assembly (11784502) (Group 0105)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				TANK TARGET ASSEMBLY	
				GROUP 0105	
1	PA000	19200	11784606	COVER,ACCESS	1
2	PA0ZZ	19200	9375732	GASKET	1
3	PA0ZZ	19200	11784540	SIGN,ATTENTION	1
4	PA0ZZ	19200	11784541	SIGN,CAUTION	1
5	XA0ZZ	19200	11784441	COVER,TOP	1
6	PA0ZZ	96906	MS35338-44	WASHER,LOCK	9
7	PA0ZZ	96906	MS35206-279	SCREW,MACHINE	4
8	PAFZZ	19200	11784608	BAR,CROSS	2
9	PAFZZ	96906	MS3367-1-9	STRAP,TIEDOWN,ELECT ELECTRICAL	2
10	XD0ZZ	19200	11784539	PLATE, IDENTIFICATION	1
11	XDFZZ	19200	11784538	SIGN,SERIAL NUMBER	1
12	XDFZZ	19200	11784567-4	RIVET,POP	4
13	PAFZZ	96906	MS27183-42	WASHER,FLAT	23
14	PAFZZ	96906	MS35338-43	WASHER,LOCK	26
15	PAFZZ	96906	MS35207-261	SCREW,MACHINE	23
16	A0000	19200	11784506	TARGET HOLDER ASSEMBLY SEE FIGURE C11 FOR COMPONENT PARTS	2
17	PA0FF	19200	11784510	CABLE ASSEMBLY SPECIAL PURPOSE SEE FIGURE C15 FOR COMPONENT PARTS	1
18	PA0FF	19200	11784509	CABLE ASSEMBLY, ELECTRICAL SEE FIGURE C14 FOR COMPONENT PARTS	1
19	PA0FF	19200	11784508	CABLE ASSEMBLY, ELECTRICAL SEE FIGURE C13 FOR COMPONENT PARTS	1
20	PA0DD	19200	11784504	CONTROL ASSEMBLY SEE FIGURE C17 FOR COMPONENT PARTS	1
21	PA0ZZ	19200	11784605	STABILIZER	1
22	PAFZZ	96906	MS35338-45	WASHER,LOCK	14
23	PAFZZ	96906	MS90725-35	BOLT,MACHINE	12
24	PAFZZ	19200	11784607	FRAME,PROTECTION	2
25	PAFZZ	19200	11784610	PLATE,NUT	2
26	PAFZZ	19200	11784609	STOP,RUBBER	2
27	PAFZZ	96906	MS16997-60	SCREW,CAP,SOCKET HE	4
28	XDFZZ	19200	11784626	PLATE,BASE	1
29	PA0ZZ	19200	11784572-2	SCREW,MACHINE	1
30	PA0ZZ	96906	MS35206-241	SCREW,MACHINE	2
31	PA0ZZ	96906	MS35338-42	WASHER,LOCK	2
32	PA0ZZ	19200	9375736	CHANNEL,RUBBER	1
33	PAFZZ	19200	11784611	COVER,SIDE	1
34	PAFZZ	19200	11784549-2	SCREW,MACHINE	4
35	PA0ZZ	19200	11784545	CATCH,CLAMPING	2
36	PAFZZ	96906	MS21044-N08	NUT,SELF-LOCKING,HE	4
37	PA0ZZ	19200	11784548	NUT	1
38	PA0ZZ	19200	9375761	BRACKET,MOUNTING, RECEIVER	1
39	PA0ZZ	96906	MS27183-9	WASHER,FLAT	2
40	PAFZZ	19200	9375759	RETAINER,NUT AND BO	2
41	PAFZZ	19200	11784549-1	SCREW,MACHINE	4
42	PAFZZ	19200	11784521	HOUSING,BEARING UNI ASSEMBLY	1
43	XAFZZ	19200	11784621	SHAFT,DRIVE	1

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
44	PAFZZ	96906	MS16998-26	SCREW,CAP,SOCKET HE	3
45	PAFZZ	96906	MS27183-8	WASHER,FLAT	3
46	PAFZZ	19200	11784623	ACTUATOR,LIMIT SWITCH	2
47	PAFZZ	96906	MS35206-282	SCREW,MACHINE	4
48	PAFZZ	96906	MS35333-40	WASHER,LOCK	4
49	PAFZZ	96906	MS3367-4-9	STRAP,TIEDOWN,ELECT ELECTRICAL	V
50	PAFZZ	96906	MS27183-10	WASHER,FLAT	4
51	PAFZZ	19200	11784625	PLATE,MOUNTING LIMIT SWITCH	1
52	PAFZZ	96906	MS35338-40	WASHER,LOCK	6
53	PAFZZ	96906	MS51861-14C	SCREW,TAPPING,THREA	6
54	PAFZZ	19200	11784522	HOUSING,BEARING UNI ASSEMBLY WITH TAPPED HOLES	1
55	PAFZZ	96906	MS16997-100	SCREW,CAP,SOCKET HE	4
56	PAFZZ	96906	MS35338-46	WASHER,LOCK	4
57	PAFZZ	19200	11784613	SEAL,SHAFT	2
58	PAFZZ	19200	11784569-2	CLAMP,LOOP	1
59	PAFZZ	96906	MS27183-6	WASHER,FLAT	1
60	PAFZZ	96906	MS35333-37	WASHER,LOCK	1
61	PAFZZ	96906	MS35206-228	SCREW,MACHINE	1
62	PAFZZ	19200	11784624	PLATE,MOUNTING LIMIT SWITCH	1
63	PAFZZ	19200	11784622	ACTUATOR,LIMIT SWITCH	1
64	PA0ZZ	96906	MS90725-32	BOLT,MACHINE	2
65	PA0ZZ	96906	MS27183-12	WASHER,FLAT	2
66	PAFZZ	19200	9375747	HOSE,HYDRAULIC	2
67	PAFZZ	96906	MS39086-251	PIN,SPRING	4
68	PAFZZ	96906	MS24665-355	PIN,COTTER	4
69	PAFZZ	19200	11784617	JOURNAL	2
70	XAFZZ	19200	11784627	FRAME,BASE	1
71	PA0D0	19200	9375758	HYDRAULIC UNIT ASSEMBLY.SEE FIGURE C16 FOR COMPONENT PARTS	1
72	PA0ZZ	96906	MS90725-6	SCREW,CAP,HEXAGON H	1
73	PAFZZ	19200	11784618	WASHER,FLAT PRESSURE	4
74	PA0FF	19200	11784619-1	CYLINDER,HYDRAULIC DOUBLE ACTING.SEE FIGURE C12 FOR COMPONENT PARTS	1
75	PAFZZ	19200	11784547	ADAPTER,STRAIGHT,PI	2

END OF FIGURE

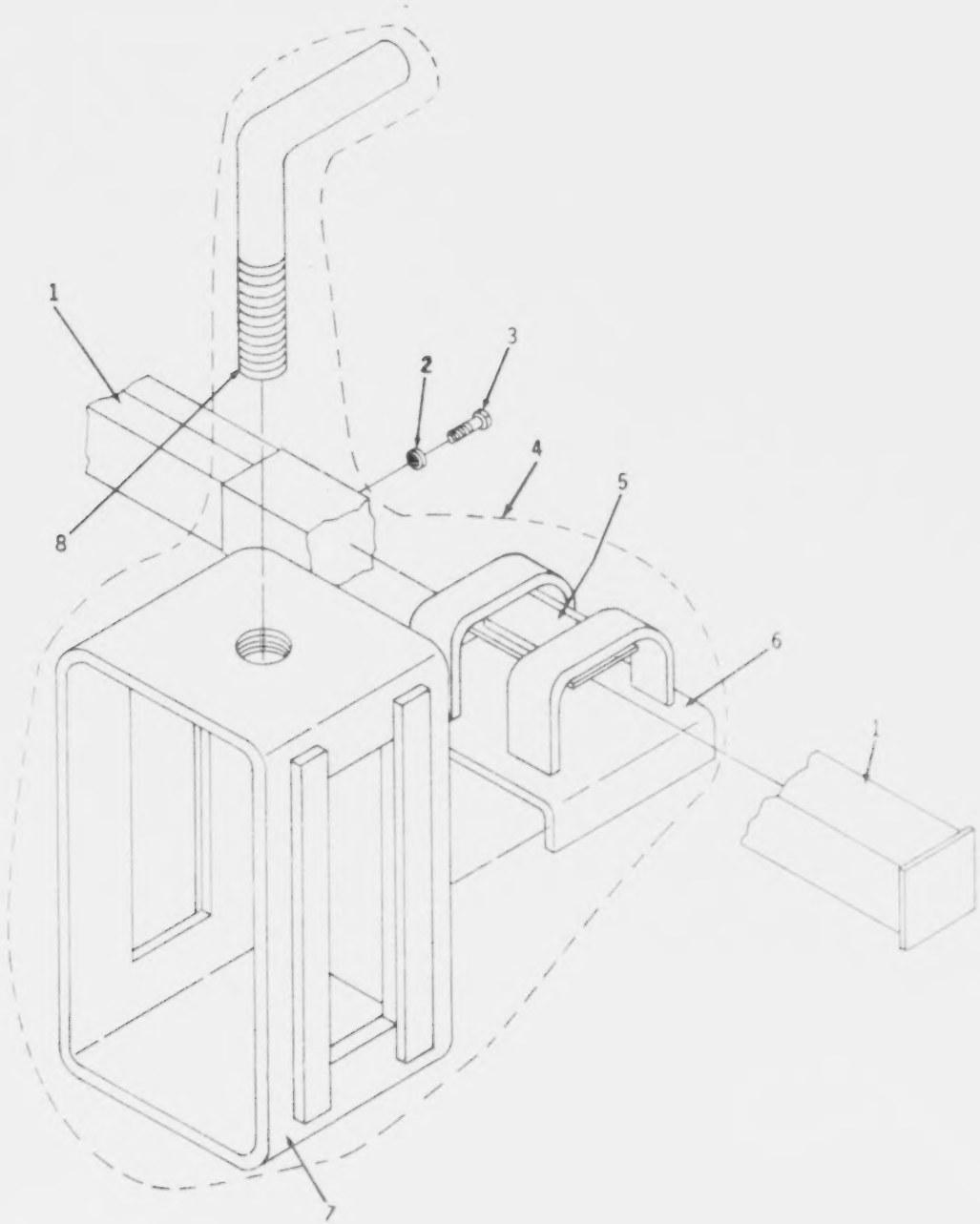

Figure C11. Target Holder Assembly (11784506) (Group 010501)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				TARGET HOLDER ASSEMBLY	
				GROUP 010501	
1	PAOZZ	19200	11784550	SHAFT,EXTENSION	1
2	PAOZZ	96906	MS35338-43	WASHER,LOCK	1
3	PAOZZ	96906	MS35207-260	SCREW,MACHINE	1
4	PAOOO	19200	11784507	CLAMP ASSEMBLY SEE FIGURE C11 FOR COMPONENT PARTS	1
5	PAOZZ	19200	11784553	.PAD,CLAMP	1
6	PAOZZ	19200	11784552	.RETAINER,PAD	1
7	XAOZZ	19200	11784551	.HOLDER,CLAMP	1
8	PAOZZ	19200	11784554	.SCREW,CLAMP	1

END OF FIGURE

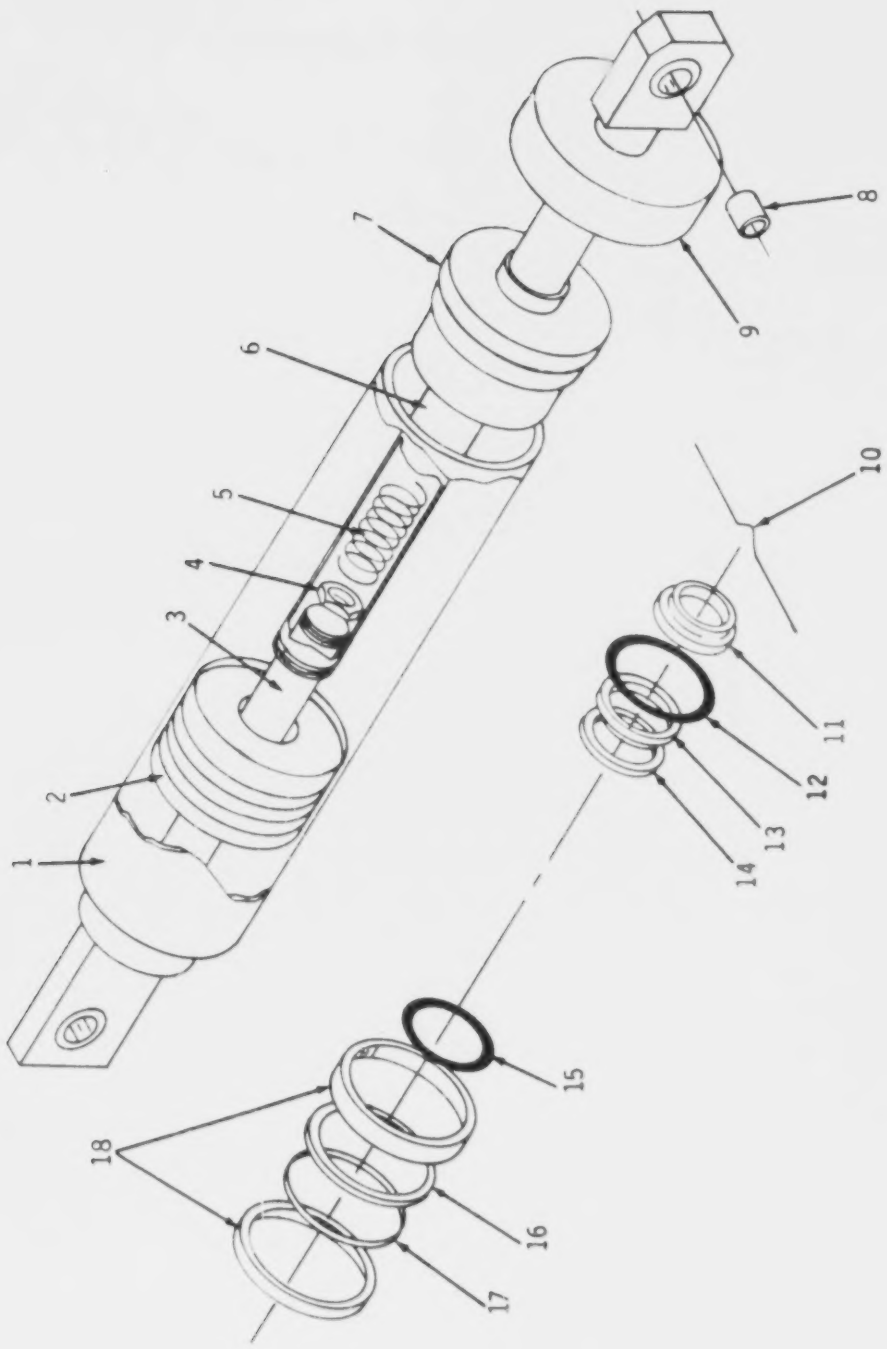

Figure C12. Hydraulic Cylinder (11784619-1) (Group 010502)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				HYDRAULIC CYLINDER	
				GROUP 010502	
1	XAFZZ	19200	11784619-10	BARREL ASSEMBLY	1
2	PAFZZ	19200	11784619-3	PISTON	1
3	PAFZZ	19200	11784619-2	CUSHION SPEAR	1
4	PAFZZ	19200	11784619-8	LOCKNUT	1
5	PAFZZ	19200	11784619-9	SPRING	1
6	PAFZZ	19200	11784619-11	PISTON ROD ASSEMBLY	1
7	PAFZZ	19200	11784619-13	GLAND	1
8	PAFZZ	19200	11784619-17	BUSHING	1
9	PAFZZ	19200	11784619-15	COLLAR,BARREL	1
10	PAFZZ	19200	11784619-19	KIT,REPAIR HYDRAULIC CYLINDER	1
11	KFFZZ	19200	11784619-16	..WIPER,ROD	1
12	KFFZZ	19200	11784619-14	..SEAL,GLAND	1
13	KFFZZ	19200	11784619-18	..SEAL,ROD	1
14	KFFZZ	19200	11784619-12	..SEAL,ROD EXPANDER	1
15	KFFZZ	19200	11784619-7	..SEAL ROD AND PISTON	1
16	KFFZZ	19200	11784619-6	..SEAL,PISTON	1
17	KFFZZ	19200	11784619-5	..SEAL,PISTON	1
18	KFFZZ	19200	11784619-4	..RING,PISTON	2

END OF FIGURE

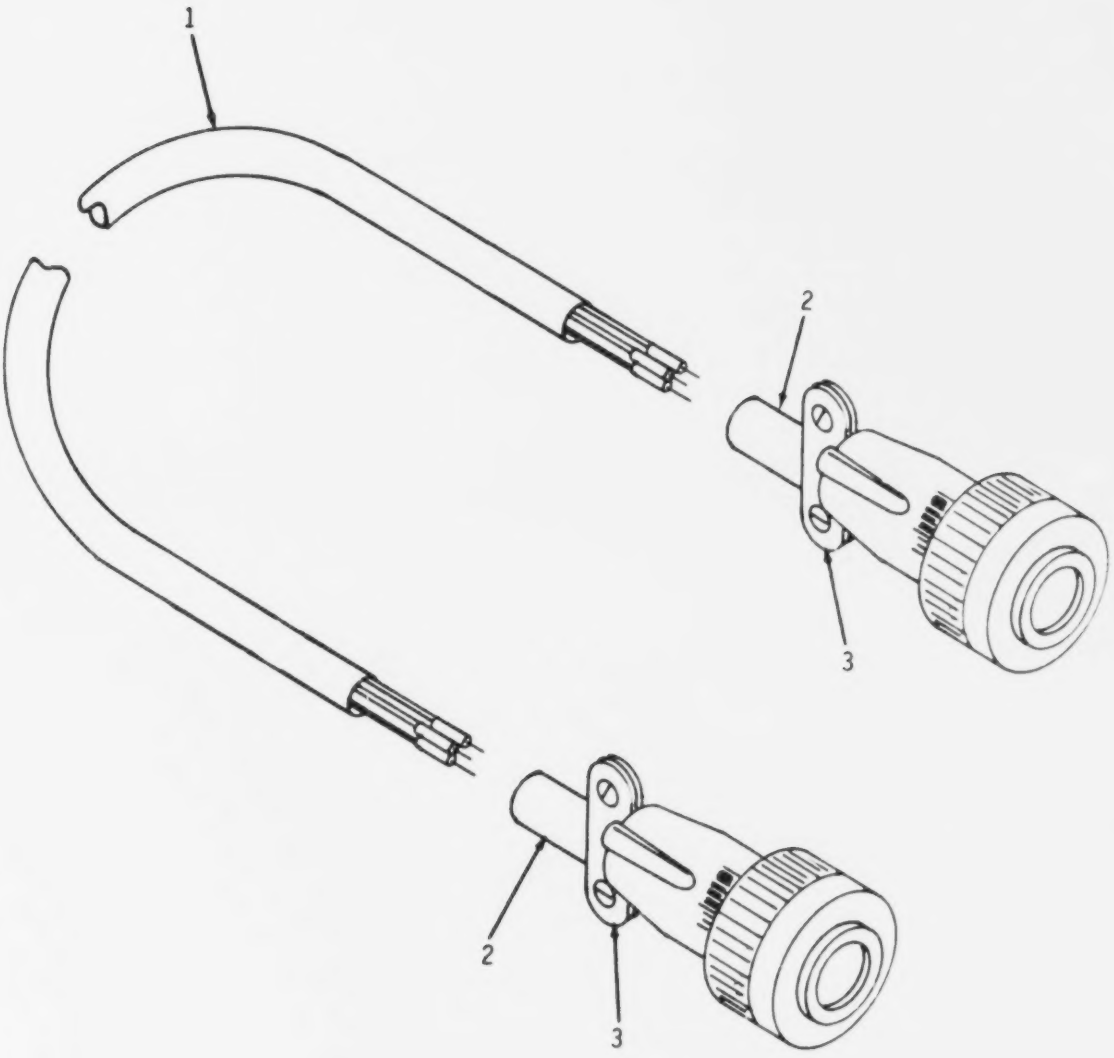

Figure C13. Cable Assembly,
Special Purpose, Electrical (11784508) (Group 010503)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				CABLE ASSEMBLY,SPECIAL PURPOSE ELECTRICAL	
				GROUP 010503	
1	PAFZZ	19200	11784560-2	CABLE,ELECTRICAL	V
2	PAFZZ	81349	M23053/14-007-C	INSULATION SLEEVING	V
3	PAFZZ	96906	MS3456W16S-1P	CONNECTOR,PLUG,ELEC ELECTRICAL	2

END OF FIGURE

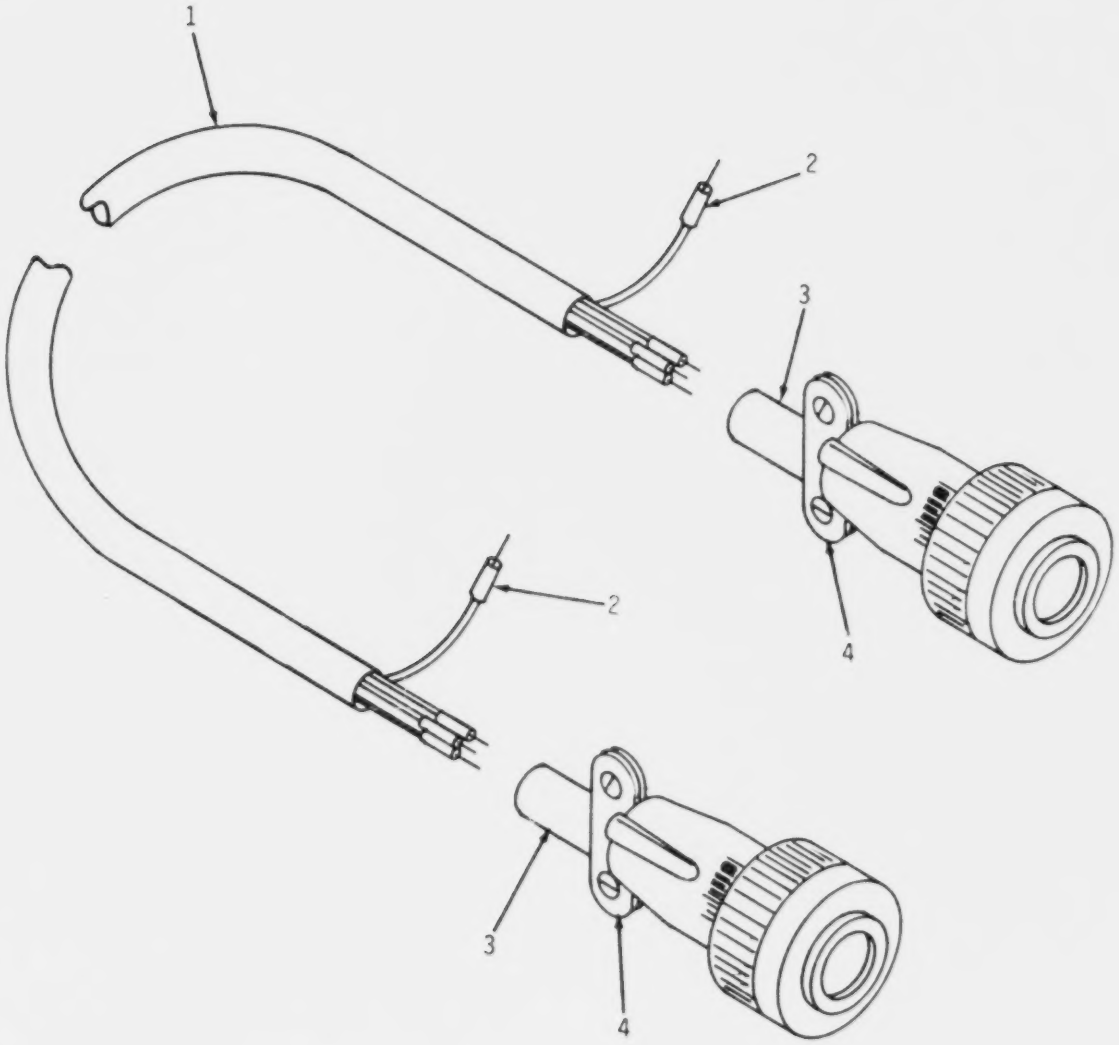

Figure C14. Cable Assembly,
Special Purpose, Electrical (11784509) (Group 010504)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				CABLE ASSEMBLY,SPECIAL PURPOSE ELECTRICAL	
				GROUP 010504	
1	PAFZZ	19200	11784560-2	CABLE,ELECTRICAL	V
2	PAFZZ	81349	M23053/14-003-C	INSULATION SLEEVING	V
3	PAFZZ	81349	M23053/14-007-C	INSULATION SLEEVING	V
4	PAFZZ	96906	MS3456W16S1S	CONNECTOR,PLUG,ELEC ELECTRICAL	2

END OF FIGURE

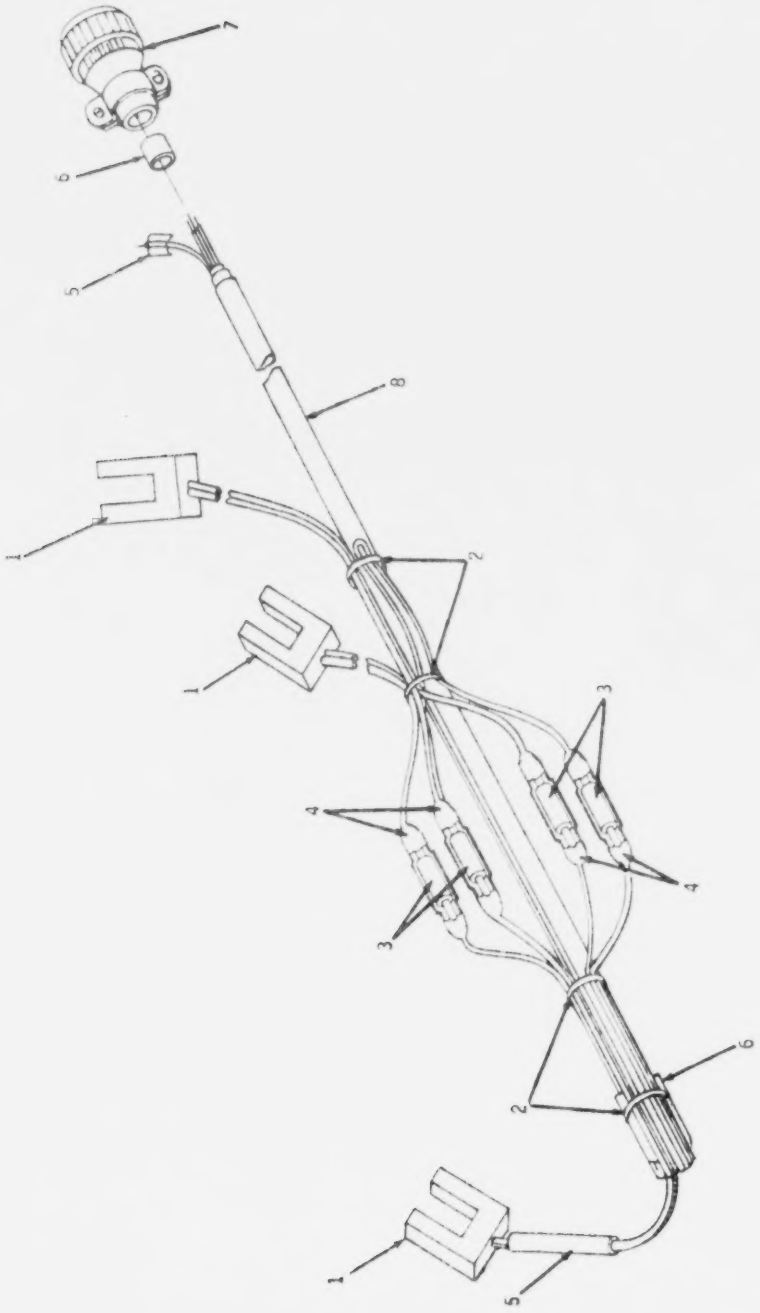

Figure C15. Cable Assembly,
Special Purpose, Electrical (11784510) (Group 010505)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				CABLE ASSEMBLY,SPECIAL PURPOSE ELECTRICAL	
				GROUP 010505	
1	PAFZZ	19200	11784511	SWITCH,MAGNETIC	3
2	PAFZZ	96906	MS3367-4-9	STRAP,TIEDOWN,ELECT ELECTRICAL	4
3	PAFZZ	19200	11784474-1	SPLICE,CONDUCTOR	4
4	PAFZZ	81349	M23053/14-005-C	TUBING,SHRINK	V
5	PAFZZ	81349	M23053/14-003-C	INSULATION SLEEVING	V
6	PAFZZ	81349	M23053/14-007-C	INSULATION SLEEVING	V
7	PAFZA	19200	11784662	CONNECTOR,PLUG,ELEC ELECTRICAL RECEPTACLE	1
8	PAFZZ	19200	11784560-2	CABLE,ELECTRICAL PURPOSE,ELECTRICAL	V

END OF FIGURE

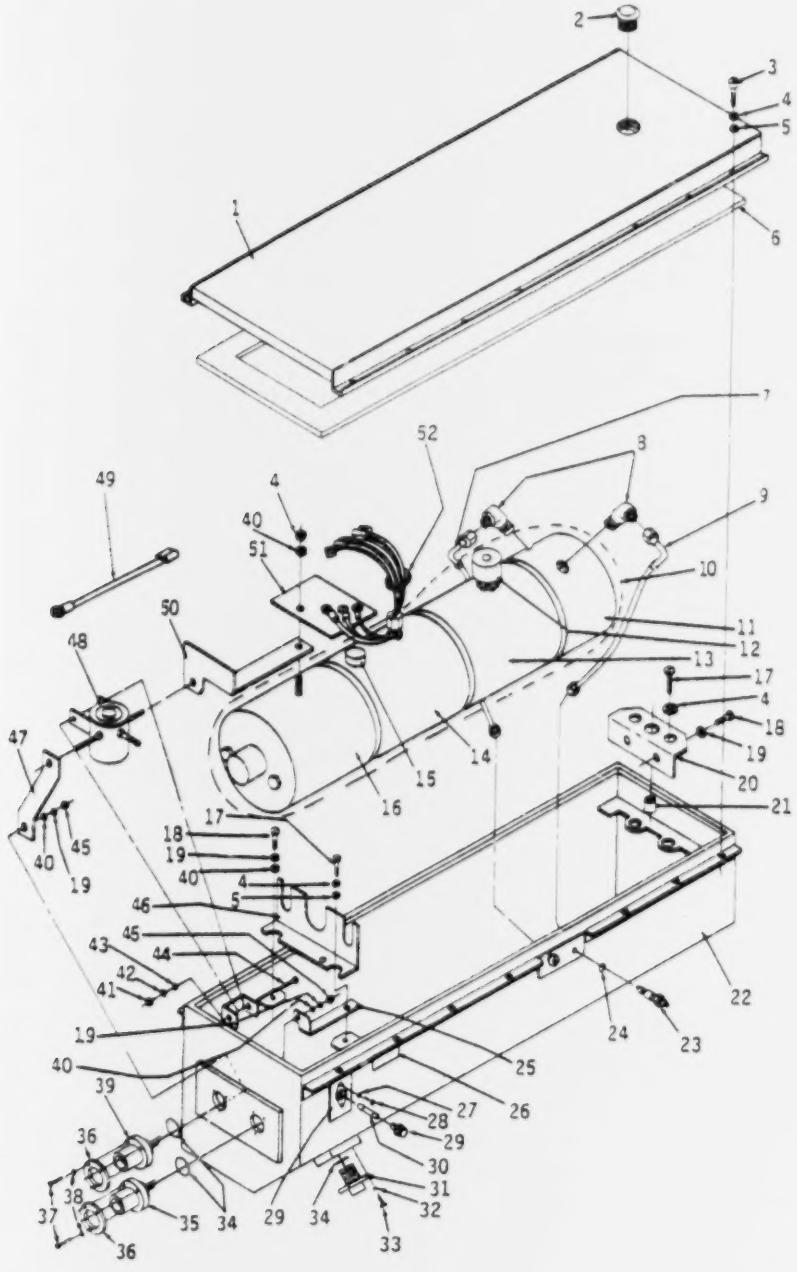

Figure C16. Hydraulic Unit (9375758) (Group 010506)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				HYDRAULIC UNIT	
				GROUP 010506	
1	XAOZZ	19200	9375740	COVER,BOX	1
2	PAOZZ	19200	11784645	PLUG,MACHINE THREAD	1
3	PAOZZ	96906	MS16997-60	SCREW,CAP,SOCKET HE	14
4	PAOZZ	96906	MS35338-44	WASHER,LOCK	18
5	PAOZZ	96906	MS27183-10	WASHER,FLAT	15
6	PAOZZ	19200	9375743	GASKET	1
7	PAOZZ	19200	9375746	HOSE,HYDRAULIC	1
8	PAOZZ	96906	MS51508A4-4	ELBOW,PIPE TO TUBE	2
9	PAOZZ	19200	9375748	HOSE,HYDRAULIC	1
10	PAODD	19200	11784520-1	MOTOR AND VALVE UNIT	1
11	PADDD	94433	60839	.VALVE ASSEMBLY	1
12	PAOZZ	94433	61143	.PLUG,VENT	1
13	XDDZZ	94433	66657	.TANK	1
14	PADZZ	94433	62427	.PUMP AND BASE ASSEMBLY	1
15	PAOZZ	94433	61420	.FITTING ASSEMBLY STRAIN RELIEF	1
16	PADDD	94433	68080	.MOTOR,ELECTRIC	1
17	PAOZZ	96906	MS90725-6	SCREW,CAP,HEXAGON H	3
18	PAOZZ	96906	MS90725-32	BOLT,MACHINE	4
19	PAOZZ	96906	MS35338-45	WASHER,LOCK	6
20	PAOZZ	19200	9375752	BRACKET,MOUNTING	1
21	PAOZZ	96906	MS27130-S71	NUT,PLAIN,BLIND RIV	2
22	PAOZZ	19200	9375754	BOX,HYDRAULIC UNIT	1
23	PAOZZ	19200	9375760	ADAPTER,STRAIGHT,PI	2
24	PAOZZ	96906	MS28776-012	PACKING,PREFORMED	2
25	PAOZZ	19200	9375712	BUS,CONDUCTOR	1
26	XDDZZ	19200	9375727	SIGN,SERIAL NUMBER	1
27	PAOZZ	96906	MS35333-38	WASHER,LOCK	2
28	PAOZZ	96906	MS35206-243	SCREW,MACHINE	2
29	PAOZZ	19200	9375730	FUSEHOLDER,WIRING ASSEMBLY	1
30	PAOZZ	19200	9375720	FUSE,CARTRIDGE	1
31	PAOZZ	19200	9375751	CABLE ASSEMBLY	1
32	PAOZZ	96906	MS35333-36	WASHER,LOCK	4
33	PAOZZ	96906	MS35206-214	SCREW,MACHINE	4
34	PAOZZ	96906	MS28775-020	PACKING,PREFORMED	3
35	PAOZZ	19200	9375718	RECEPTACLE,CABLE, BATTERY, ELECTRICAL	1
36	PAOZZ	19200	9375729	WASHER,FLAT	2
37	PAOZZ	96906	MS35206-246	SCREW,MACHINE	6
38	PAOZZ	96906	MS35338-42	WASHER,LOCK	6
39	PAOZZ	19200	9375717	RECEPTACLE,CABLE, BATTERY, ELECTRICAL	1
40	PAOZZ	96906	MS27183-12	WASHER,FLAT	5
41	PAOZZ	96906	MS35650-302	NUT,PLAIN,HEXAGON	1
42	PAOZZ	96906	MS35338-43	WASHER,LOCK	1
43	PAOZZ	96906	MS27183-42	WASHER,FLAT	1
44	PAOZZ	19200	9375757	SCREW,MACHINE	1
45	PAOZZ	96906	MS51967-5	NUT,PLAIN,HEXAGON	2
46	XDOZZ	19200	9375753	BRACKET,MOUNTING	1

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
47	PAOZZ	19200	9375713	BUS,CONDUCTOR.....	1
48	PAOZZ	19200	11784520-2	SWITCH,SOLENIOD.....	1
49	PAOZZ	19200	9375731	WIRE ASSEMBLY.....	1
50	PAOZZ	19200	9375714	BUS,CONDUCTOR.....	1
51	PAOZZ	19200	11784514	CIRCUIT CARD ASSEMB.....	1
52	PAOZZ	96906	MS3367-1-9	STRAP,TIEDOWN,ELECT ELECTRICAL.....	2

END OF FIGURE

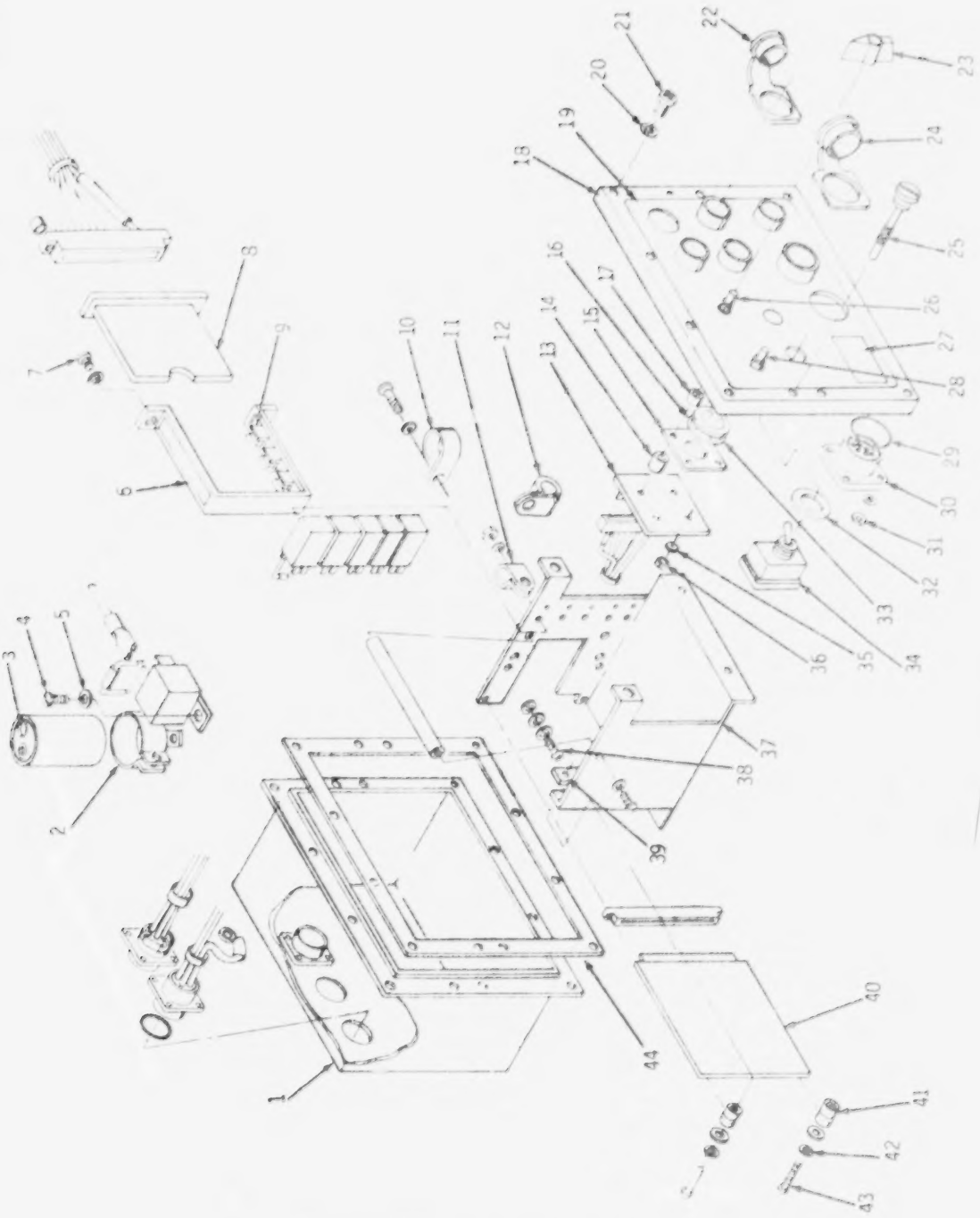

Figure C17. (Sheet 1 of 2)
Electronic Unit (11784504) (Group 010507)

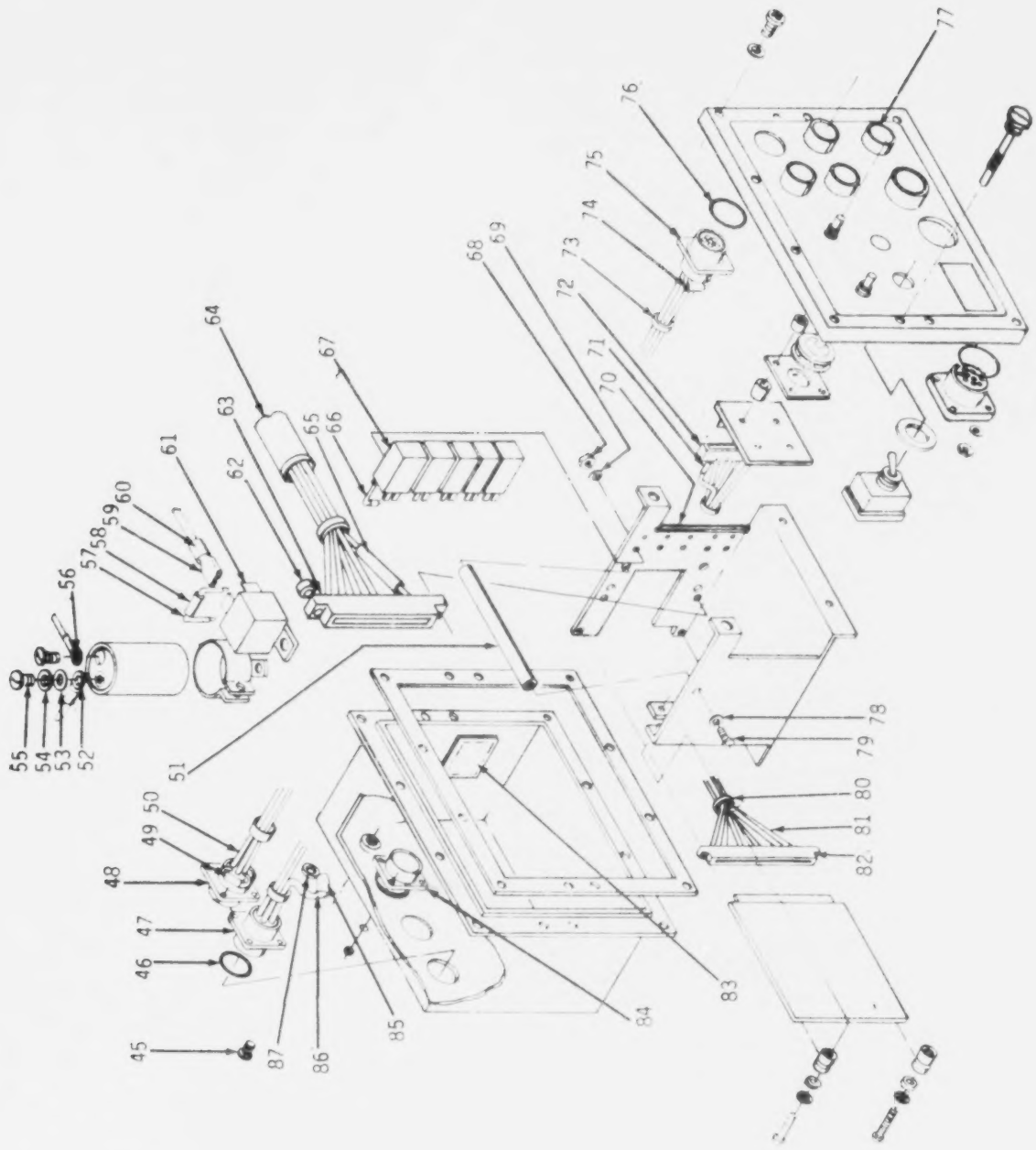

Figure C17. (Sheet 2 of 2)
Electronic Unit (11784504) (Group 010507)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				ELECTRONIC UNIT	
				GROUP 010507	
1	XAFZZ	19200	11784633	BOX,ELECTRONIC	1
2	PAFZZ	19200	11784671	RETAINER,CAPACITOR	1
3	PAFZZ	19200	11784670	CAPACITOR,FIXED,ELE	1
4	PAFZZ	96906	MS35206-240	SCREW,MACHINE	4
5	PAFZZ	96906	MS35333-38	WASHER,LOCK	14
6	PAFZZ	19200	11784642	HOLDER,ELECTRICAL C	1
7	PAFZZ	19200	11784555-4	SCREW,MACHINE	2
8	PAFDD	19200	11784526	CIRCUIT CARD ASSEMB ASSEMBLY, AMPLIFIER	1
9	PAFZZ	19200	11784643	HOLDER,ELECTRICAL C CARD	1
10	PAFZZ	19200	11784669-1	CLAMP,LOOP	1
11	PAFZZ	19200	11784669-3	CLAMP,LOOP	1
12	PAFZZ	19200	11784669-4	CLAMP LOOP	1
13	PAFDD	19200	11784531	CIRCUIT CARD ASSEMB	1
14	PAFZZ	19200	11784644-3	SPACER,SLEEVE	4
15	PAFZZ	19200	11784637	PLATE	1
16	PAFZZ	96906	MS28775-013	PACKING,PREFORMED	1
17	PAFZZ	19200	11784644-2	SPACER,SLEEVE	4
18	XAFZZ	19200	11784632	PANEL,ELECTRONIC	1
19	PAFZZ	19200	11784636	MARKER,IDENTIFICATI	1
20	PAFZZ	96906	MS35333-40	WASHER,LOCK	10
21	PAFZZ	96906	MS35206-279	SCREW,MACHINE	10
22	PADZZ	19200	11784631	COVER,ELECTRICAL CO	5
23	PADZZ	19200	11784652	KNOB	2
24	PADZZ	19200	11784630	COVER,PROTECTIVE	2
25	PADZZ	19200	11784638	SCREW,MACHINE	2
27	XDDZZ	19200	11784542	SIGN,ELECTRONIC UNIT	1
28	PAFZZ	19200	11784529	SWITCH,ROTARY ROTARY	1
29	PAFZZ	96906	MS28775-023	PACKING,PREFORMED	2
30	PADZZ	19200	11784667	CONNECTOR,RECEPTACL RECEPTACLE	2
31	PAFZZ	96906	MS35649-242	NUT,PLAIN,HEXAGON	40
32	PAFZZ	19200	11784629	PACKING,PREFORMED	1
33	PAFZZ	19200	11784640	LENS,LIGHT	1
34	PAFZZ	96906	MS25307-272	SWITCH,TOGGLE	1
35	PAFZZ	96906	MS27183-7	WASHER,FLAT	4
36	PAFZZ	96906	MS35649-282	NUT,PLAIN,HEXAGON	8
37	PADZZ	19200	11784635	CHASSIS	1
38	PAFZZ	19200	11784555-3	SCREW,MACHINE	2
39	PAFZZ	19200	11784639	NUT STRIP	1
40	PAFDD	19200	11784523	CIRCUIT CARD ASSEMB ASSEMBLY,LOGIC	1
41	PAFZZ	19200	11784628	SPACER,SLEEVE CIRCUIT CARD	2
42	PAFZZ	96906	MS35333-36	WASHER,LOCK	50
43	PAFZZ	96906	MS35206-221	SCREW,MACHINE	2
44	PAFZZ	19200	11784634	GASKET	1
45	PAFZZ	19200	11784645	PLUG,MACHINE THREAD	1
46	PAFZZ	96906	MS28775-020	PACKING,PREFORMED	1
47	PAFZZ	96906	MS3452W16S-1S	CONNECTOR,RECEPTACL ELECTRICAL RECEPTACLE	1

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
48	PAFZZ	96906	MS3452W16S1P	CONNECTOR,RECEPTACL ELECTRICAL RECEPTACLE	1
49	PAFZZ	81349	M39014/01-1593	CAPACITOR,FIXED,CER	2
50	PAFZZ	81349	MW-C24(7)U9	WIRE,ELECTRICAL WHITE	V
51	PAFZZ	19200	11784641	ROD,STRAIGHT,HEADLE	1
52	PAFZZ	96906	MS25036-108	TERMINAL,LUG	1
53	PAFZZ	96906	MS15795-908	WASHER,FLAT	2
54	PAFZZ	96906	MS35333-39	WASHER,LOCK	2
55	PAFZZ	96906	MS35215-51	SCREW,MACHINE	2
56	PAFZZ	96906	MS25036-103	TERMINAL,LUG	1
57	PAFZZ	81349	M23053/14-003-C	INSULATION SLEEVING	V
58	PAFZZ	81349	JAN1N4246	SEMICONDUCTOR DEVIC	6
59	PAFZZ	19200	11784559-2	TERMINAL,QUICK DISC	4
60	PAFZZ	19200	11784496	TUBING,NONMETTALLIC	V
61	PAFZZ	19200	11784649	RELAY	1
62	PAFZZ	19200	11784644-1	SPACER,SLEEVE	2
63	PADZZ	19200	11784658-1	CONNECTOR,RECEPTACL RECEPTACLE	1
64	PADZZ	81349	M23053/14-007-C	INSULATION SLEEVING	V
65	PADZZ	19200	11784560-3	CABLE,SPECIAL ELECTRICAL	V
66	PAFZZ	81349	RCR20G10RJ	RESISTOR,FIXED,COMP	1
67	PAFZZ	19200	11784648	RELAY,ELECTROMAGNET	5
68	PAFZZ	96906	MS35649-262	NUT,PLAIN,HEXAGON	5
69	PAFZZ	96906	MS35333-37	WASHER,LOCK	5
70	PAFZZ	19200	11784646	NONMETALLIC CHANNEL	1
71	PAFZZ	19200	11784657-2	TERMINAL,PLUG	8
72	PADZZ	19200	11784657-1	CONNECTOR,PLUG,ELEC	1
73	PAFZZ	96906	MS3367-4-9	STRAP,TIEDOWN,ELECT ELECTRICAL	V
74	PAFZZ	81349	M39014-01-1333	CAPACITOR,FIXED,CER	4
75	PAFZZ	19200	11784663	CONNECTOR,RECEPTACL RECEPTACLE	4
76	PAFZZ	96906	MS28775-022	PACKING,PREFORMED	7
77	PAFZA	19200	11784665	CONNECTOR,RECEPTACL RECEPTACLE	1
78	PAFZZ	96906	MS27183-4	WASHER,FLAT	11
79	PAFZZ	96906	MS35206-217	SCREW,MACHINE	8
80	PAFZZ	96906	MS3367-1-9	STRAP,TIEDOWN,ELECT ELECTRICAL	V
81	PADZZ	81349	M16878/12BHD6	WIRE,ELECTRICAL BLUE	V
82	PADZZ	19200	11784658-2	CONNECTOR,RECEPTACL RECEPTACLE	1
83	PAFZZ	19200	11784647	DESICCANT,ACTIVATED	1
84	PAFZZ	19200	11784661	CONNECTOR,RECEPTACL ELECTRICAL RECEPTACLE	1
85	PAFZZ	81349	M23053/14-005-C	TUBING,SHRINK	V
86	PAFZZ	19200	11784565-1	WIRE,ELECTRICAL BUS BAR	V
87	PAFZZ	96906	MS25036-148	TERMINAL,LUG	1

END OF FIGURE

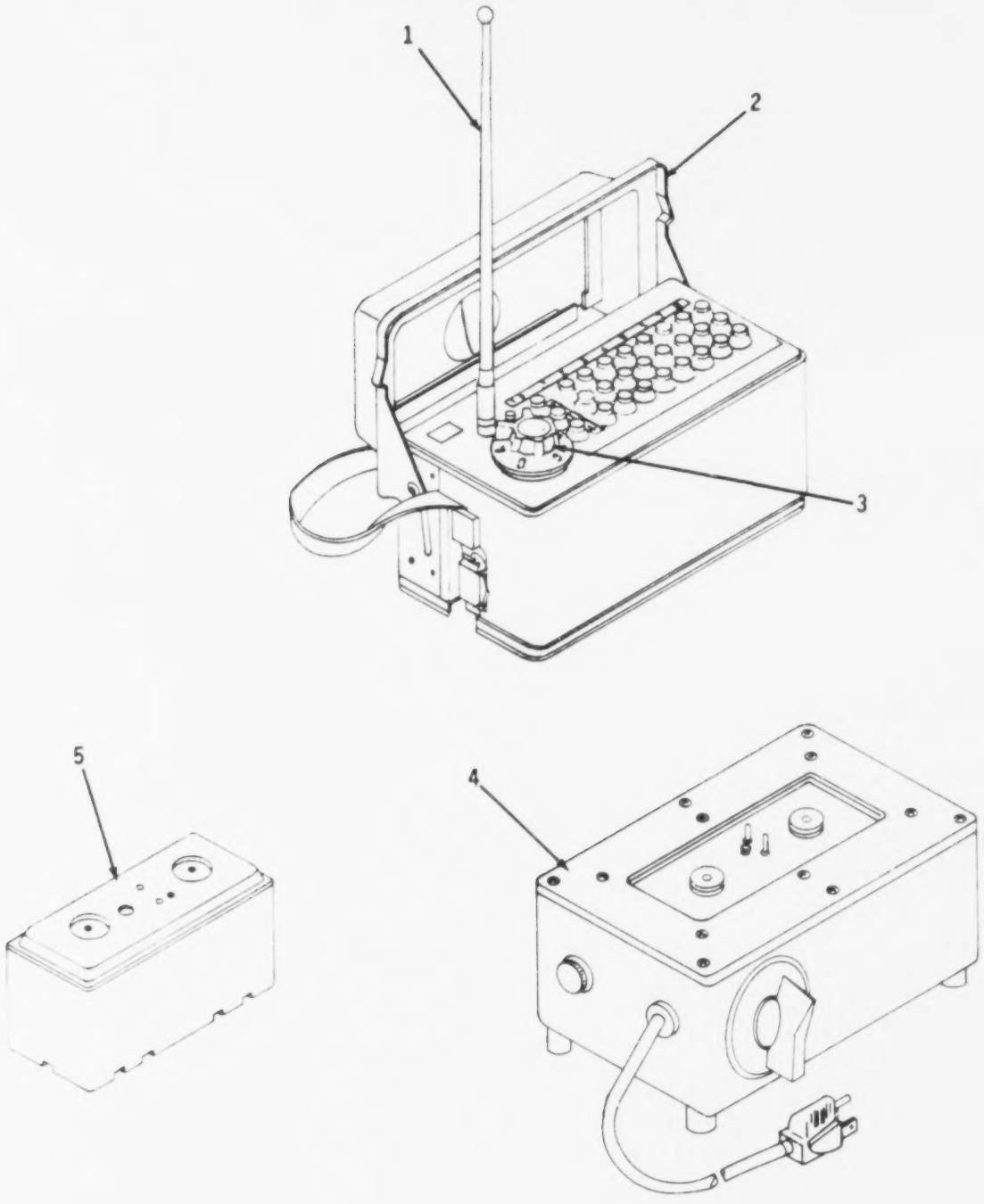

Figure C18. Transmitter with Battery and Selector (11784700) (Group 02)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				TRANSMITTER W/BATTERY	
				GROUP 02	
1	PAOZZ	19200	11784704	ANTENNA	1
2	PFODD	19200	11784701	TRANSMITTER OPERATOR CONTROL DEVICE SEE FIGURE C19 FOR COMPONENT PARTS	1
3	XDODD	19200	11784702-1	SELECTOR, CHANNEL A	1
3	XDODD	19200	11784702-2	SELECTOR, CHANNEL B	1
3	XDODD	19200	11784702-3	SELECTOR, CHANNEL C	1
3	XDODD	19200	11784702-4	SELECTOR, CHANNEL D	1
3	XDODD	19200	11784702-5	SELECTOR, CHANNEL E	1
3	XDODD	19200	11784702-6	SELECTOR, CHANNEL A-B	1
3	XDODD	19200	11784702-7	SELECTOR, CHANNEL D-E	1
3	XDODD	19200	11784702-8	SELECTOR, CHANNEL A-C	1
3	XDODD	19200	11784702-9	SELECTOR, CHANNEL C-E	1
3	XDODD	19200	11784702-10	SELECTOR, CHANNEL A-E	1
4	PAOFF	19200	11784430	CHARGER, BATTERY SEE FIGURE C23 FOR COMPONENT PARTS 01H	1
5	PAOZZ	19200	11784703	BATTERY ASSEMBLY	1

END OF FIGURE

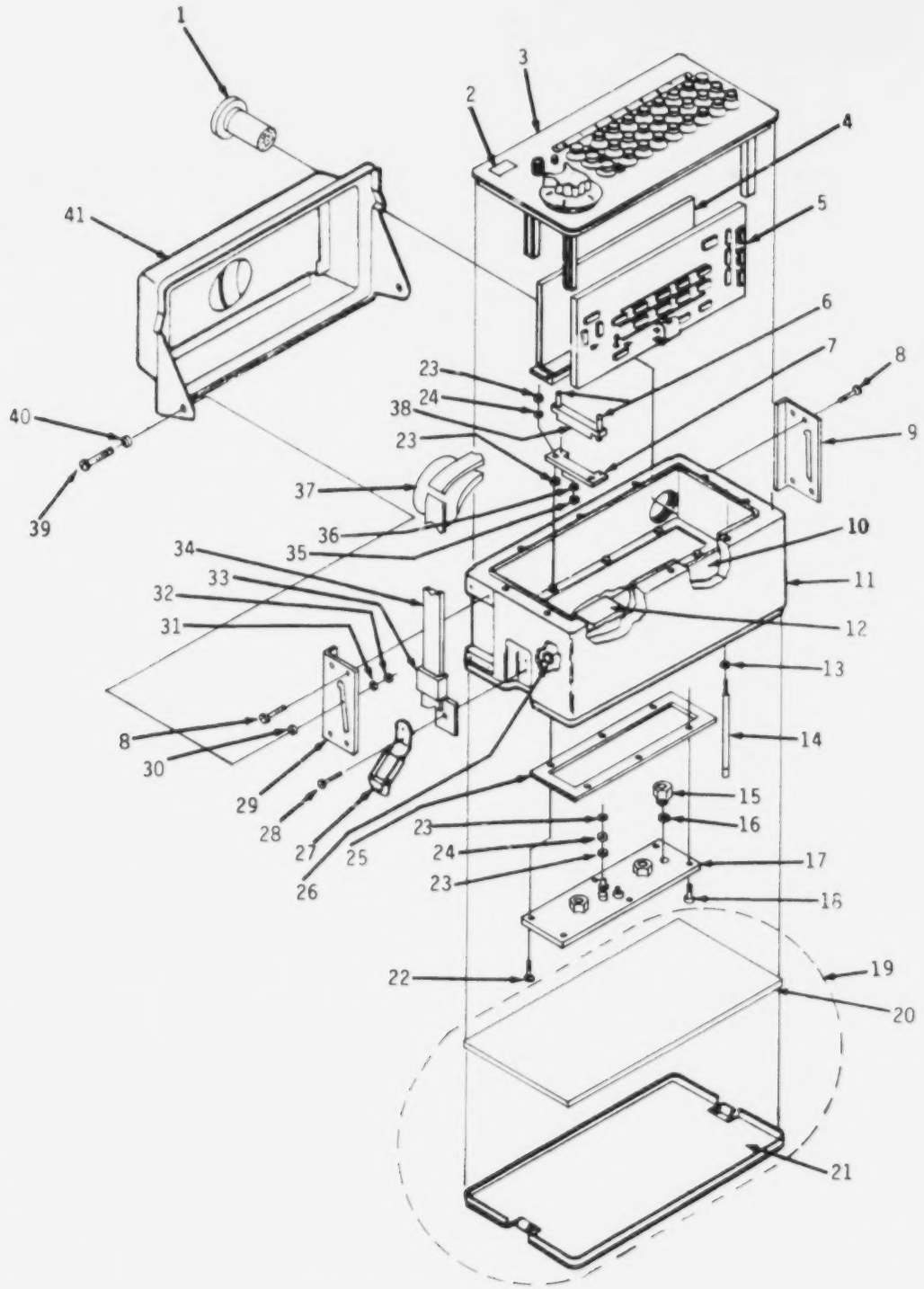

Figure C19. Transmitter (11784701) (Group 0201)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				TRANSMITTER	
				GROUP 0201	
1	PAOZZ	19200	11784705	INDICATOR,HUMIDITY	1
2	XOOZZ	19200	11784748	SIGN,MODEL & SERIAL NUMBER	1
3	AOOOO	19200	11784718	PANEL ASSEMBLY WITH CIRCUIT CARD SEE FIGURE C20 FOR COMPONENT PARTS	1
4	PAOOO	19200	11784714	CIRCUIT CARD ASSEMBLY,HIGH FREQUENCE	1
5	PAOOO	19200	11784711-2	CIRCUIT CARD ASSEMB ASSEMBLY,LOGIC	1
6	PAOZZ	19200	11784726	PIN,SHOULDER,HEADLE	2
7	XOOZZ	19200	11784725	BRACKET,ANGLE	1
8	PAOZZ	19200	11784574-2	SCREW,MACHINE	8
9	PAOZZ	19200	11784728-1	BRACKET,ANGLE	1
10	XOOZZ	19200	11784729	BOARD,INSULATING	2
11	XOOZZ	19200	11784709	CASE	1
12	XOOZZ	19200	11784789	CUSHION,RUBBER	1
13	PAOZZ	19200	11784849-1	PACKING,PREFORMED	10
14	PAOZZ	19200	11784727	SCREW,MACHINE	10
15	PAOZZ	19200	11784708	VALVE	1
16	PAOZZ	19200	11785164	GASKET	1
17	PAOZZ	19200	11784717	PLATE,BATTERY MOUNTING	1
18	PAOZZ	19200	11784555-4	SCREW,MACHINE	4
19	PAOOO	19200	11784706	PLATE,BOTTOM	1
20	PAOZZ	19200	11784767	GASKET,RUBBER	1
21	XAOZZ	19200	11784766	PLATE,BASE	1
22	PAOZZ	19200	11784555-6	SCREW,MACHINE	2
23	PAOZZ	19200	11784568-2	NUT,PLAIN,HEXAGON	8
24	PAOZZ	19200	11784570-2	WASHER,SPRING TENSI	4
25	PAOZZ	19200	11784744	GASKET	1
26	PAOZZ	19200	11784569-4	WASHER	4
27	PAOZZ	19200	11784790	CATCH,PULL DOWN	2
28	PAOZZ	19200	11784567-2	RIVET,POP	8
29	PAOZZ	19200	11784728-2	BRACKET,ANGLE	1
30	PAOZZ	19200	11784569-2	WASHER,FLAT	2
31	PAOZZ	19200	11784730	SPACER,SLEEVE	2
32	PAOZZ	19200	11784578	NUT,SELF-LOCKING,HE	2
33	PAOZZ	19200	11784724	LOOP,STRAP FASTENER	2
34	PAOZZ	19200	11784745	STRAP,LEATHER	1
35	PAOZZ	19200	11784568-1	NUT,PLAIN,HEXAGON H	2
36	PAOZZ	19200	11784570-1	WASHER,LOCK	2
37	PAOZZ	19200	11784746	PAD,CUSHIONING	1
38	PAOZZ	19200	11784710	CONTACT ASSEMBLY,EL	1
39	PAOZZ	19200	11784555-5	SCREW,MACHINE	2
40	PAOZZ	96906	MS27129-4	WASHER,FINISHING	2
41	XOOZZ	19200	11784707	COVER,TOP ASSEMBLY	1

END OF FIGURE

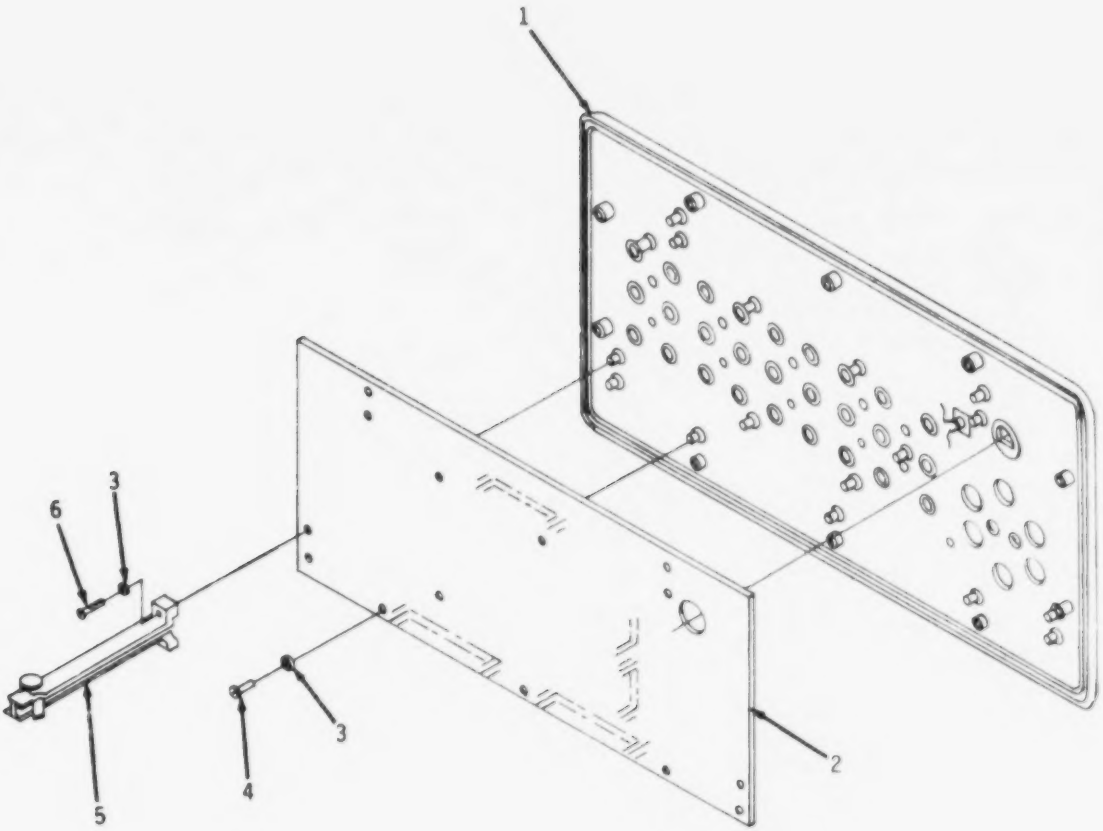

Figure C20. Panel Assembly (11784718) (Group 020101)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				PANEL ASSEMBLY	
				GROUP 020101	
1	ADDDD	19200	11784722	PANEL ASSEMBLY SEE FIGURE C21 FOR COMPONENT PARTS	1
2	PADDD	19200	11784719	CIRCUIT CARD ASSEMB ASSEMBLY,MOTHER	1
3	PADZZ	19200	11784570-1	WASHER,LOCK	17
4	PADZZ	19200	11784555-1	SCREW,MACHINE	9
5	PADZZ	19200	11784782	RAIL,GUIDE	4
6	PADZZ	19200	11784555-4	SCREW,MACHINE	8

END OF FIGURE

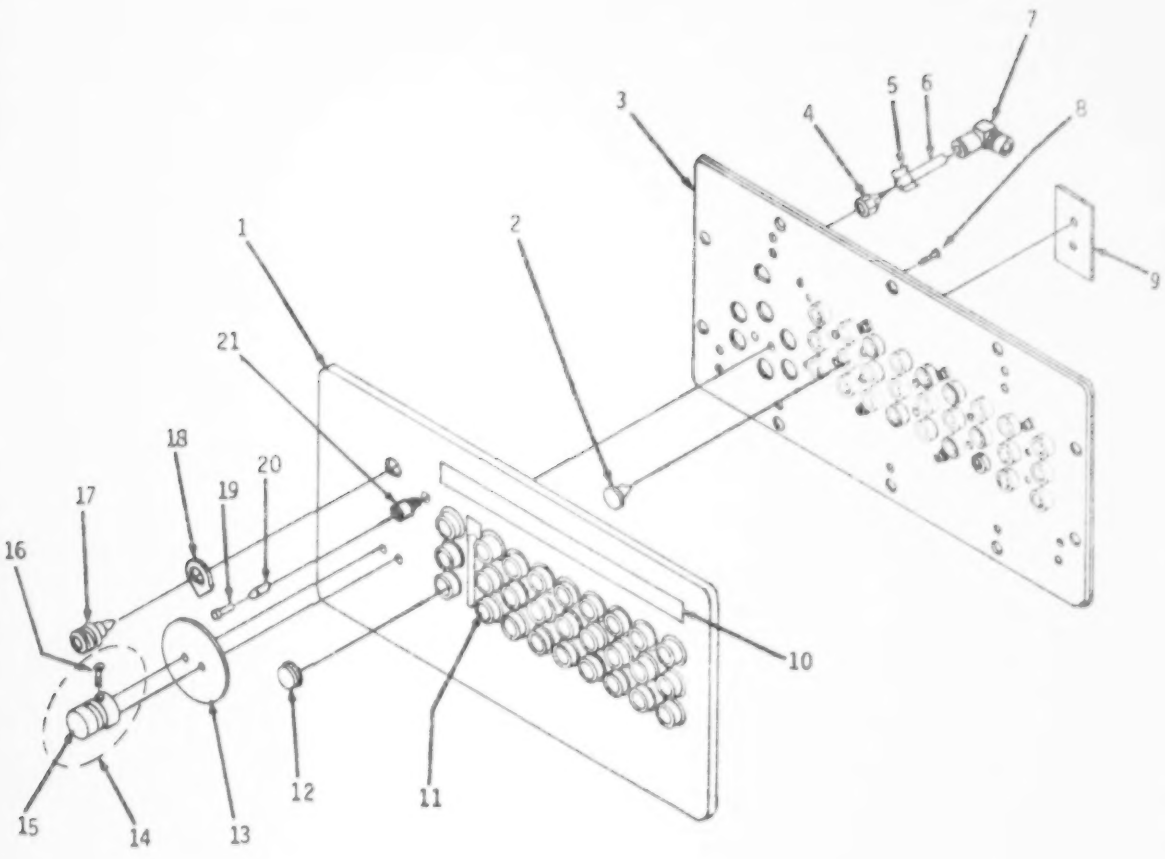

Figure C21. Panel Subassembly (11784722) (Group 02010101)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				PANEL SUBASSEMBLY	
				GROUP 02010101	
1	PADZZ	19200	11784773	PANEL,RUBBER	1
2	PADZZ	19200	11784774	BUTTON	27
3	ADDDD	19200	11784723	PANEL ASSEMBLY, WITH GUIDE SOCKETS.SEE FIGURE C22 FOR COMPONENT PARTS	1
4	PADZZ	19200	11784776	NUT,CONNECTOR	1
5	PADZZ	81349	M23053/14-005-C	TUBING,SHRINK	V
6	PADZZ	81349	M17/113-R6316	CABLE,RADIO FREQUEN	1
7	PADZZ	19200	11784850	CONNECTOR,PLUG,ELEC	1
8	PADZZ	19200	11784574-4	SCREW,MACHINE	2
9	PADZZ	19200	11784781	FILM,ADHESIVE	1
10	PADZZ	19200	11784778	SIGN,SELECTION	1
11	PADZZ	19200	11784779	SIGN	1
12	PADZZ	19200	11784780	CAP,PUSH BUTTON	27
13	PADZZ	19200	11784775	WASHER	1
14	PADDD	19200	11784771	PIN ASSEMBLY	1
15	PADZZ	19200	11784747	.PIN	1
16	PADZZ	19200	11784572-1	.SCREW,MACHINE	1
17	PADZZ	19200	11784772	CONNECTOR ASSEMBLY ANTENNA	1
18	PADZZ	19200	11784777	WASHER	1
19	PADZZ	19200	11784751	LENS,LAMP	1
20	PADZZ	19200	11784752	LAMP	1
21	PADZZ	19200	11784750	LAMPHOLDER	1

END OF FIGURE

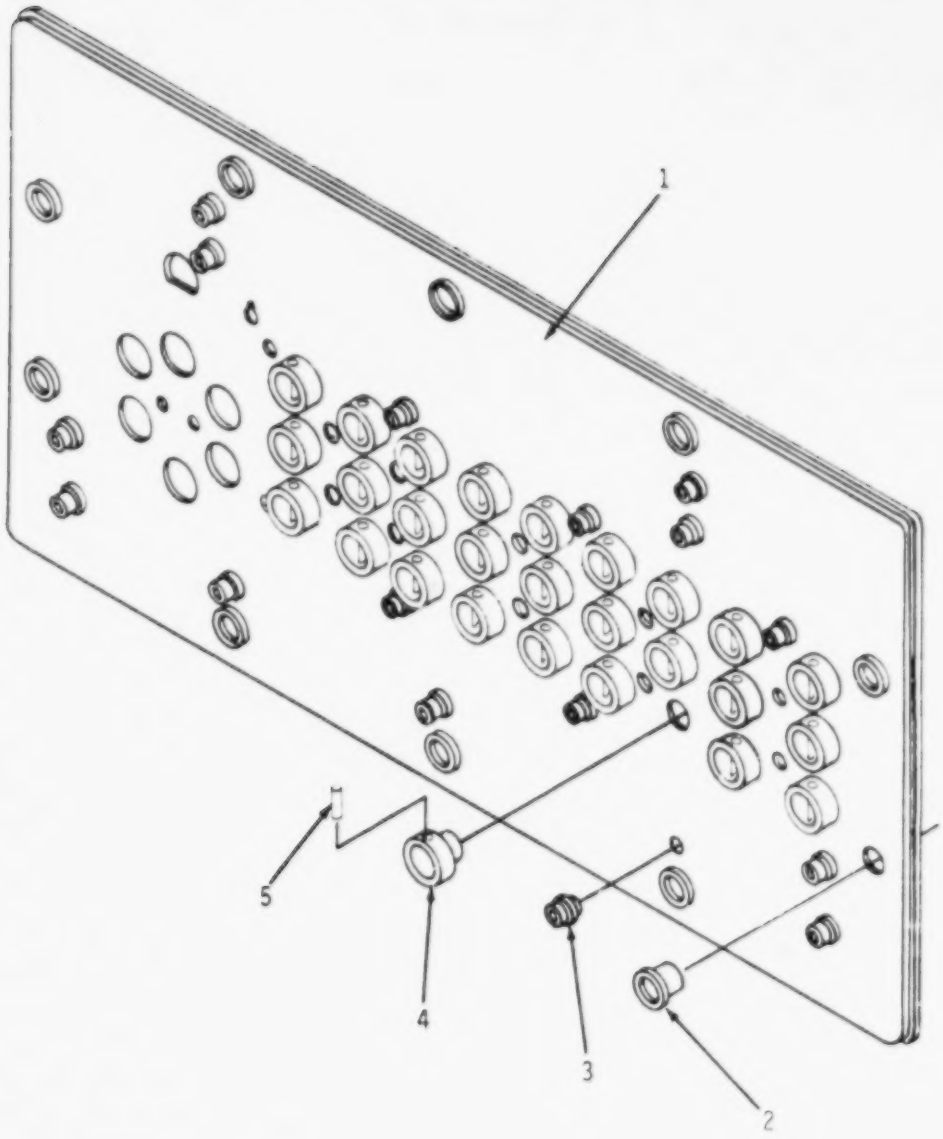

Figure C22. Panel (11784723) (Group 0201010101)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				PANEL	
				GROUP 0201010101	
1	PADZZ	19200	11784768	PANEL	1
2	PADZZ	19200	11784769	NUT	10
3	PADZZ	19200	11784845	NUT,CLINCH	17
4	PADZZ	19200	11784770	GUIDE,DELECTRICAL	27
5	PADZZ	96906	MS16562-193	PIN,SPRING	27

END OF FIGURE

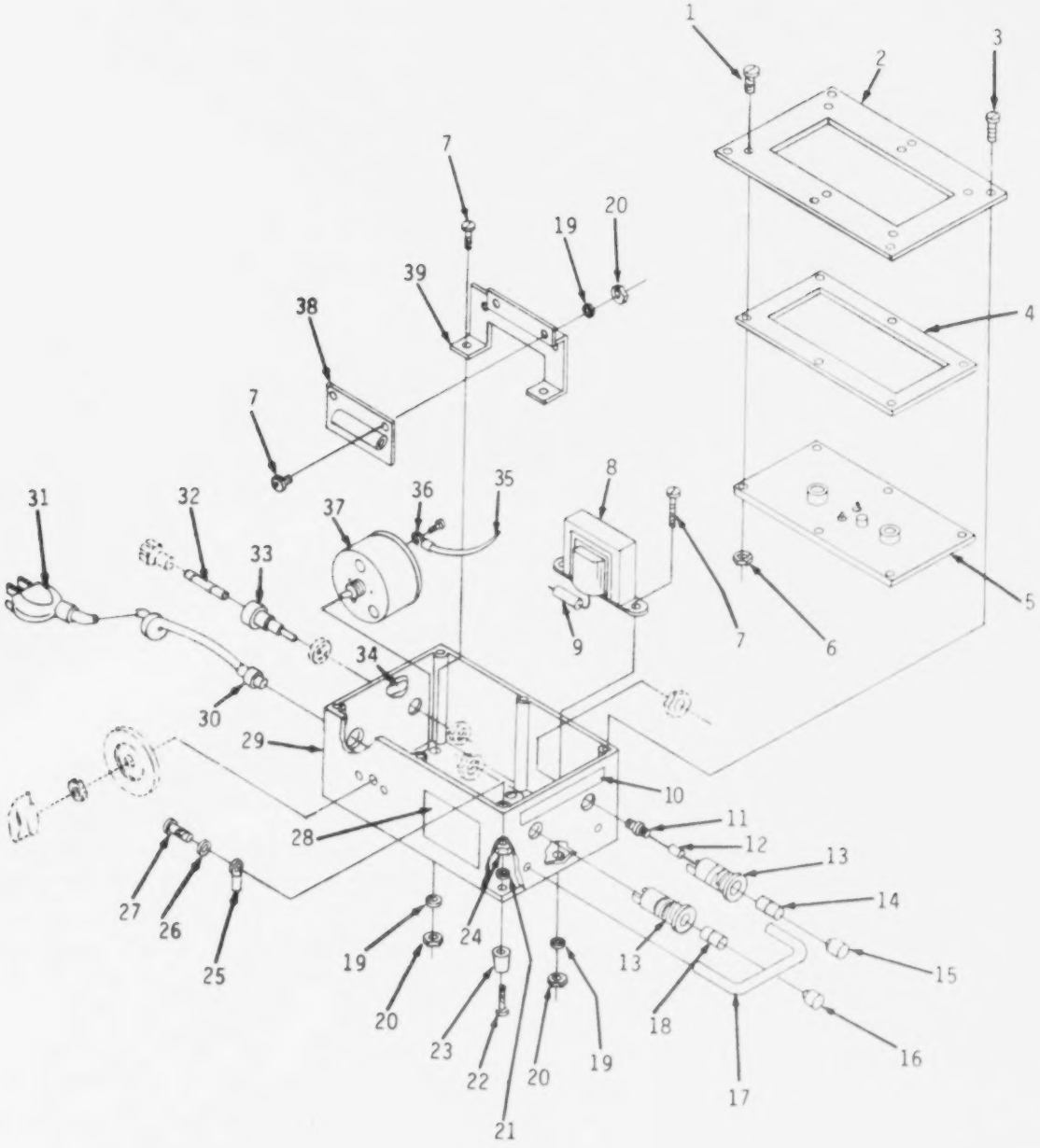

Figure C23. Battery Charger (11784430) (Group 0202)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				BATTERY CHARGER	
				GROUP 0202	
1	PAFZZ	96906	MS35206-247	SCREW,MACHINE	6
2	XAFZZ	19200	11784436-2	COVER,BATTERY BOX	1
3	PAFZZ	96906	MS35190-238	SCREW,MACHINE	6
4	PAFZZ	19200	11784437	GASKET	1
5	XDFZZ	19200	11784433	PLATE,BATTERY MOUNTING	1
6	PAFZZ	96906	MS21045-08	NUT,SELF-LOCKING,HE	6
7	PAFZZ	96906	MS35206-243	SCREW,MACHINE	6
8	PAFZZ	19200	11784446	TRANSFORMER, POWER	1
9	PAFZZ	19200	11784474-1	SPLICE,CONDUCTOR	2
10	XDFZZ	19200	11784445	PLATE,NAME	1
11	PAFZZ	96906	MS3367-4-9	STRAP,TIEDOWN,ELECT	5
12	PAFZZ	81349	M23053/14-005-C	TUBING,SHRINK	V
13	PAFZZ	19200	11784465	HOLDER,LAMP	2
14	PAFZZ	19200	11784466-2	LAMP,INCANDESCENT	1
15	PAFZZ	19200	11784468	LENS,CLEAR	1
16	PAFZZ	81349	LC16WT3	LENS,LIGHT	1
17	XDFZZ	19200	11784464	HANDLE	1
18	PAFZZ	19200	11784466-1	LAMP,INCANDESCENT	1
19	PAFZZ	96906	MS35333-38	WASHER,LOCK	6
20	PAFZZ	96906	MS35649-282	NUT,PLAIN,HEXAGON	6
21	PAFZZ	96906	MS35333-37	WASHER,LOCK	4
22	PAFZZ	96906	MS35206-230	SCREW,MACHINE	4
23	XDFZZ	19200	11784472	BUMPER	4
24	PAFZZ	96906	MS35649-262	NUT,PLAIN,HEXAGON	4
25	PAFZZ	96906	MS25036-103	TERMINAL,LUG	1
26	PAFZZ	96906	MS35333-39	WASHER,LOCK	3
27	PAFZZ	96906	MS35207-263	SCREW,MACHINE	2
28	XDFZZ	19200	11784440	SIGN,BATTERY CHARGER	1
29	XAFZZ	19200	11784436-1	BOX,BATTERY CHARGER	1
30	XDFZZ	19200	11784498	STRAIN RELIEF	1
31	XDFZZ	19200	11784486	CORD,POWER	1
32	PAFZZ	81349	F02B250V1/4AS	FUSE,CARTRIDGE	1
33	PAFZZ	81349	FHN20G	FUSEHOLDER,EXTRACTO	1
34	XDFZZ	19200	11784444	PLATE,NAME	1
35	PAFZZ	81349	MWC18-16UD	WIRE,ELECTRICAL	V
36	PAFZZ	96906	MS25036-102	TERMINAL,LUG	2
37	PAFZZ	19200	11784447	SWITCH,TIME	1
38	XDFZZ	19200	11784434	BOARD,CONNECTOR ASSEMBLY	1
39	XDFZZ	19200	11784438	BRACKET,MOUNTING	1

END OF FIGURE

NATIONAL STOCK NUMBER AND PART NUMBER INDEX

NATIONAL STOCK NUMBER INDEX

STOCK NUMBER	FIG.	ITEM
5910-00-010-8717	C17	49
5315-00-012-0123	C10	68
5310-00-014-5850	C10	13
	C16	43
5310-00-045-3296	C10	14
	C11	2
	C16	42
5310-00-045-3299	C4	18
	C10	31
	C16	38
5310-00-045-5207	C17	53
5305-00-059-4553	C23	3
5310-00-060-9435	C8	10
6210-00-067-8380	C23	16
5305-00-068-0502	C10	72
	C16	17
5305-00-071-1786	C3	7
5975-00-074-2072	C10	9
	C16	52
	C17	80
5310-00-081-4219	C10	65
	C16	40
5310-00-082-1404	C10	59
5305-00-088-9044	C11	3
5910-00-113-5515	C17	74
5940-00-113-9828	C17	87
5910-00-143-0501	C7	2
5940-00-143-4771	C17	56
	C23	25
5940-00-143-4780	C17	52
5305-00-163-6561	C10	53
5310-00-178-8631	C4	11
5325-00-185-0012	C3	4
	C5	13
5310-00-193-7577	C16	32
	C17	42
5940-00-204-8966	C23	36
5310-00-209-0965	C3	6
5306-00-225-8497	C10	64
	C16	18
5306-00-225-8500	C10	23
6145-00-238-6992	C7	7
5920-00-280-3529	C23	32
5340-00-282-7965	C17	10
6145-00-316-9039	C17	86
5310-00-407-9566	C10	22
	C16	19
5315-00-531-7881	C10	67
5310-00-543-2410	C5	9
	C10	52
6145-00-548-2966	C23	35
6145-00-548-2974	C7	4
	C17	50
5310-00-550-1130	C10	48
	C17	20
5920-00-556-0144	C23	33
5310-00-559-0070	C16	27
	C17	5
	C23	19
5935-00-563-1173	C17	82
5310-00-576-5752	C17	54
	C23	26
5310-00-579-0079	C10	60
	C17	69
	C23	21
5310-00-582-5965	C10	6
	C16	4
6145-00-583-3876	C7	8
5330-00-585-7723	C4	14
	C5	7
	C16	34
	C17	46
5935-00-599-9604	C14	4
4730-00-606-1989	C16	8
6145-00-635-0034	C7	3
5310-00-637-9541	C10	56
5910-00-649-4121	C17	2
5330-00-684-3420	C17	16
5330-00-691-0145	C17	76
5365-00-725-2038	C17	14
5330-00-727-2637	C17	29
5975-00-727-5153	C9	1
	C10	49
	C15	2
	C17	73
	C23	11
6145-00-767-3399	C17	81
5310-00-809-4058	C10	50
	C16	5
5310-00-809-4085	C3	5
5310-00-809-8544	C17	35
5310-00-809-8546	C10	45
5310-00-811-3494	C10	36
5310-00-823-8804	C10	39
5310-00-829-9981	C3	9
5310-00-880-7744	C4	23
	C16	45
5310-00-880-8189	C3	8
5315-00-882-1438	C22	5
5310-00-889-2549	C23	6

NATIONAL STOCK NUMBER AND PART NUMBER INDEX

NATIONAL STOCK NUMBER INDEX

STOCK NUMBER	FIG.	ITEM
5305-00-889-2997	C5	10
5305-00-889-2999	C17	79
5305-00-889-3000	C23	22
5930-00-901-4275	C17	34
5961-00-914-9740	C17	58
6145-00-918-9494	C21	6
5310-00-934-9739	C17	31
5310-00-934-9747	C17	68
	C23	24
5310-00-934-9751	C16	41
5310-00-934-9757	C17	36
	C23	20
5975-00-936-7377	C9	2
5935-00-937-2782	C21	7
5310-00-950-1310	C17	78
5305-00-954-8151	C17	55
5305-00-978-9395	C10	55
5305-00-983-7428	C10	44
5305-00-983-8084	C10	27
	C16	3
5305-00-984-4978	C17	43
5305-00-984-4988	C10	61
5305-00-984-6189	C10	30
5305-00-984-6191	C16	28
	C23	7
5305-00-984-6194	C4	19
	C16	37
5305-00-984-6195	C23	1
5305-00-984-6226	C17	4
5305-00-988-1723	C10	7
	C17	21
5305-00-988-1726	C10	47
5305-00-989-7434	C23	27
5305-00-990-6444	C10	15
5305-00-993-0190	C8	11
	C16	33
5310-00-996-0133	C19	40
5950-01-004-2496	C23	8
5935-01-035-5156	C17	48
5935-01-050-6586	C13	3
5340-01-054-8824	C10	58
5310-01-085-1208	C16	21
6920-01-085-8514	C1	2
5935-01-094-9306	C17	75
5935-01-105-1187	C7	1
	C17	47
5340-01-117-7702	C17	12
5306-01-165-4287	C3	13
6920-01-165-4563	C2	7
6920-01-165-4564	C2	8
5340-01-182-7616	C10	35
4730-01-190-3269	C16	23
6920-01-195-1749	C10	69
6920-01-195-1750	C2	3
5940-01-195-1753	C15	3
	C23	9
6920-01-195-1754	C3	3
5355-01-195-1757	C17	23
4730-01-195-1758	C10	75
5305-01-195-1759	C3	10
5935-01-195-1761	C17	22
6920-01-195-3539	C15	1
6920-01-201-9854	C3	2
6920-01-202-8848	C3	14
6920-01-202-8849	C3	11
6920-01-203-7820	C10	20
5999-01-204-4174	C17	13
5999-01-204-4175	C17	40
5999-01-204-4176	C17	8
5910-01-207-3566	C17	3
5365-01-207-5755	C4	3
	C16	2
	C17	45
5935-01-207-8376	C15	7
5935-01-207-8380	C17	77
5945-01-207-9434	C17	67
5999-01-207-9711	C17	9
5935-01-208-1990	C17	72
6920-01-209-2983	C17	61
5920-01-209-2989	C16	30
5999-01-209-3017	C17	6
5970-01-209-3592	C14	2
	C15	5
	C17	57
5970-01-209-3594	C13	2
	C14	3
	C15	6
	C17	64
5340-01-209-7818	C17	51
5930-01-209-8516	C17	28
7690-01-209-8655	C17	19
5310-01-210-1588	C10	73
5310-01-210-1605	C17	39
5330-01-211-1342	C17	44
5305-01-211-1377	C17	25
5330-01-213-2421	C17	32
5365-01-213-2426	C17	41
5365-01-213-2427	C3	12
5940-01-213-2458	C9	7
	C17	59

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6145-01-214-4016	C17	65
6920-01-214-6249	C17	15
5365-01-214-6400	C17	62
6210-01-214-6430	C17	33
6920-01-216-2560	C17	37
9390-01-216-9346	C17	70
5340-01-217-1200	C4	22
5365-01-217-2088	C17	17
6850-01-218-0679	C17	63
6920-01-224-6370	C17	71
6920-01-224-6371	C8	2
6920-01-224-6378	C8	8
6920-01-235-0228	C2	4
6920-01-235-0229	C8	9
6920-01-235-0230	C2	6
6920-01-235-0231	C10	3
6920-01-235-0232	C10	4
6920-01-235-0233	C10	38
6920-01-235-0234	C10	33
6920-01-235-0235	C10	19
6920-01-235-0236	C10	18
6920-01-235-0237	C10	24
6920-01-235-0238	C10	21
6920-01-235-0239	C11	4
6920-01-235-0240	C11	6
6920-01-235-0241	C11	5
6920-01-235-0242	C11	1
6920-01-235-0243	C10	26
6920-01-235-0244	C10	8
6920-01-235-0245	C10	37
6920-01-235-0246	C10	63
6920-01-235-0247	C10	46
6920-01-235-0248	C10	51
6920-01-235-0249	C10	62
5315-01-235-0283	C4	21
5330-01-235-0285	C10	2
5305-01-235-0289	C8	5
5935-01-235-0294	C8	6
3130-01-235-0295	C10	42
3130-01-235-0296	C10	54
6920-01-235-1758	C1	2
6920-01-235-1759	C9	5
6920-01-235-1760	C10	74
6920-01-235-1761	C12	2
6920-01-235-1762	C12	10
6920-01-235-1763	C12	3
6920-01-235-1764	C12	4
6920-01-235-1765	C12	5
6920-01-235-1766	C12	6
6920-01-235-1767	C12	9
6920-01-235-1768	C10	66
6920-01-235-1769	C16	49
6920-01-235-1770	C16	9
6920-01-235-1771	C16	7
6920-01-235-1772	C16	20
6920-01-235-1774	C16	11
6920-01-235-1780	C16	15
6920-01-235-1781	C16	16
6920-01-235-1783	C16	14
6920-01-235-1788	C10	25
6920-01-235-1789	C2	5
6920-01-235-1790	C4	2
6920-01-235-1791	C4	20
6920-01-235-1792	C4	13
6920-01-235-1793	C4	10
6920-01-235-1794	C4	24
6920-01-235-1795	C4	7
6920-01-235-1796	C4	6
6920-01-235-1797	C4	8
6920-01-235-1798	C4	4
6920-01-235-1799	C6	1
6920-01-235-1800	C6	8
6920-01-235-1801	C6	4
6920-01-235-1802	C6	14
6920-01-235-1803	C6	6
6920-01-235-1804	C6	2
6920-01-235-1805	C5	3
6920-01-235-1806	C5	11
6920-01-235-1807	C5	12
6920-01-235-1808	C5	4
5330-01-235-1870	C5	6
5330-01-235-1875	C16	6
5330-01-235-1876	C4	5
5305-01-235-1895	C16	44
5305-01-235-1898	C17	7
	C19	18
	C20	6
5305-01-235-1899	C17	38
5305-01-235-1900	C10	34
5305-01-235-1901	C10	41
5305-01-235-1902	C5	17
5305-01-235-1903	C6	7
5310-01-235-1922	C4	17
	C16	36
5340-01-235-1960	C16	12
5999-01-235-1967	C5	5
6150-01-235-1974	C16	47
6150-01-235-1975	C16	25
6150-01-235-1976	C16	50
6920-01-235-7563	C5	16

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6240-01-235-7566	C23	18
5935-01-235-7568	C17	84
4720-01-235-7571	C17	60
6920-01-236-0170	C19	26
6920-01-236-0171	C19	20
6920-01-236-0194	C20	5
6920-01-236-0195	C21	1
9905-01-236-0196	C21	10
6920-01-236-0197	C21	9
6130-01-236-0258	C18	4
5985-01-236-0263	C18	1
5310-01-236-0265	C19	23
5330-01-236-0287	C19	13
5330-01-236-0291	C23	4
5340-01-236-0292	C19	34
5310-01-236-0297	C19	32
5305-01-236-0300	C19	8
5305-01-236-0301	C21	8
5305-01-236-0306	C6	12
	C20	4
5305-01-236-0307	C19	22
5305-01-236-0309	C19	14
5365-01-236-0322	C19	31
5310-01-236-0325	C19	30
5310-01-236-0332	C6	13
	C19	36
	C20	3
5310-01-236-0336	C19	24
5340-01-236-0342	C19	9
5340-01-236-0343	C19	29
5340-01-236-0354	C19	33
3040-01-236-0368	C6	11
6920-01-236-0371	C19	37
5365-01-236-0394	C6	5
5935-01-236-0418	C22	4
5999-01-236-0425	C19	5
6920-01-236-0428	C6	10
6920-01-236-0429	C20	2
6920-01-236-2877	C23	13
5340-01-236-4105	C17	11
5999-01-236-4129	C5	15
5999-01-236-4130	C5	14
6130-01-236-7454	C1	3
5995-01-236-7458	C5	8
5310-01-236-7461	C19	35
5935-01-238-7770	C17	63
6920-01-238-8184	C10	32
6920-01-238-9869	C9	6
6920-01-238-9870	C11	8
6920-01-238-9871	C10	57
6145-01-238-9872	C2	2
5330-01-238-9874	C8	3
5305-01-238-9876	C10	29
5935-01-238-9877	C8	4
5935-01-238-9878	C9	4
5340-01-238-9879	C10	1
6920-01-239-1547	C10	17
6920-01-239-1548	C10	71
6920-01-239-1549	C4	15
	C16	39
6920-01-239-1550	C4	16
	C16	35
6920-01-239-1551	C16	29
6920-01-239-1552	C16	31
6920-01-239-1554	C16	48
6920-01-239-1555	C17	24
6920-01-239-1563	C19	19
6920-01-239-1564	C19	15
6920-01-239-1565	C21	17
5310-01-239-1566	C21	18
5310-01-239-1567	C21	13
5340-01-239-1568	C21	2
5310-01-239-1569	C21	12
5310-01-239-1570	C21	4
6920-01-239-1571	C21	15
6920-01-239-1572	C19	4
6140-01-239-1585	C19	17
6240-01-239-1586	C23	14
5310-01-239-1587	C22	2
5330-01-239-1592	C19	16
5330-01-239-1593	C19	25
5999-01-239-1594	C19	38
5305-01-239-1595	C19	39
5305-01-239-1596	C21	16
6685-01-239-1597	C19	1
6250-01-239-1599	C21	21
5315-01-239-1601	C19	6
9905-01-239-1603	C21	11
5999-01-239-1611	C16	51
6145-01-239-6988	C2	1
5970-01-239-8052	C8	7
	C15	4
	C17	85
	C21	5
	C23	12

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81349	FHN20G	5920-00-556-0144	C23	33
81349	F02B250V1/4AS	5920-00-280-3529	C23	32
81349	JAN1N4246	5961-00-914-9740	C17	58
81349	LC16WT3	6210-00-067-8380	C23	16
96906	MS15795-903	5310-00-045-5207	C17	53
96906	MS16562-193	5315-00-882-1438	C22	5
96906	MS16997-100	5305-00-978-9395	C10	55
96906	MS16997-60	5305-00-983-8084	C10	27
			C16	3
96906	MS16998-26	5305-00-983-7428	C10	44
96906	MS21044-N08	5310-00-811-3494	C10	36
96906	MS21045-08	5310-00-889-2549	C23	6
96906	MS24665-355	5315-00-012-0123	C10	68
96906	MS25036-102	5940-00-204-8966	C23	36
96906	MS25036-103	5940-00-143-4771	C17	56
			C23	25
96906	MS25036-108	5940-00-143-4780	C17	52
96906	MS25036-148	5940-00-113-9828	C17	87
96906	MS25307-272	5930-00-901-4275	C17	34
96906	MS27129-4	5310-00-996-0133	C19	40
96906	MS27130-S71	5310-01-085-1208	C16	21
96906	MS27183-10	5310-00-809-4058	C10	50
			C16	5
96906	MS27183-12	5310-00-081-4219	C10	65
			C16	40
96906	MS27183-16	5310-00-809-4085	C3	5
96906	MS27183-4	5310-00-950-1310	C17	78
96906	MS27183-42	5310-00-014-5850	C10	13
			C16	43
96906	MS27183-6	5310-00-082-1404	C10	59
96906	MS27183-7	5310-00-809-8544	C17	35
96906	MS27183-8	5310-00-809-8546	C10	45
96906	MS27183-9	5310-00-823-8804	C10	39
96906	MS28775-013	5330-00-684-3420	C17	16
96906	MS28775-020	5330-00-585-7723	C4	14
			C5	7
			C16	34
			C17	46
96906	MS28775-022	5330-00-691-0145	C17	76
96906	MS28775-023	5330-00-727-2637	C17	29
96906	MS28776-012		C16	24
96906	MS3367-1-9	5975-00-074-2072	C10	9
			C16	52
			C17	80
96906	MS3367-4-9	5975-00-727-5153	C9	1
			C10	49
			C15	2
			C17	73
			C23	11
96906	MS3420-8	5975-00-936-7377	C9	2
96906	MS3452W16S-1S	5935-01-105-1187	C7	1

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96906	MS3452W16S-1S	5935-01-105-1187	C17	47
96906	MS3452W16S1P	5935-01-035-5156	C17	48
96906	MS3456W16S-1P	5935-01-050-6586	C13	3
96906	MS3456W16S1S	5935-00-599-9604	C14	4
96906	MS35190-238	5305-00-059-4553	C23	3
96906	MS35206-214	5305-00-993-0190	C8	11
			C16	33
96906	MS35206-215	5305-00-889-2997	C5	10
96908	MS35206-217	5305-00-889-2999	C17	79
96906	MS35206-221	5305-00-984-4978	C17	43
96906	MS35206-228	5305-00-984-4988	C10	61
96906	MS35206-230	5305-00-889-3000	C23	22
96906	MS35206-240	5305-00-984-6226	C17	4
96906	MS35206-241	5305-00-984-6189	C10	30
96906	MS35206-243	5305-00-984-6191	C16	28
			C23	7
96906	MS35206-246	5305-00-984-6194	C4	19
			C16	37
96906	MS35206-247	5305-00-984-6195	C23	1
96906	MS35206-279	5305-00-988-1723	C10	7
			C17	21
96906	MS35206-282	5305-00-988-1726	C10	47
96906	MS35207-260	5305-00-088-9044	C11	3
96906	MS35207-261	5305-00-990-6444	C10	15
96906	MS35207-263	5305-00-989-7434	C23	27
96906	MS35215-51	5305-00-954-8151	C17	55
96906	MS35333-36	5310-00-193-7577	C16	32
			C17	42
96906	MS35333-37	5310-00-579-0079	C10	60
			C17	69
			C23	21
96906	MS35333-38	5310-00-559-0070	C16	27
			C17	5
			C23	19
96906	MS35333-39	5310-00-576-5752	C17	54
			C23	26
96906	MS35333-40	5310-00-550-1130	C10	48
			C17	20
96906	MS35333-75	5310-00-178-8631	C4	11
96906	MS35338-40	5310-00-543-2410	C5	9
			C10	52
96906	MS35338-42	5310-00-045-3299	C4	18
			C10	31
			C16	38
96906	MS35338-43	5310-00-045-3296	C10	14
			C11	2
			C16	42
96906	MS35338-44	5310-00-582-5965	C10	6
			C16	4
96906	MS35338-45	5310-00-407-9566	C10	22
			C16	19

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96906	MS35338-46	5310-00-637-9541	C10	56
96906	MS35338-47	5310-00-209-0965	C3	6
96906	MS35338-55	5310-00-060-9435	C8	10
96906	MS35489-35	5325-00-185-0012	C3	4
			C5	13
96906	MS35649-2312	5310-00-829-9981	C3	9
96906	MS35649-242	5310-00-934-9739	C17	31
96906	MS35649-262	5310-00-934-9747	C17	68
			C23	24
96906	MS35649-282	5310-00-934-9757	C17	36
			C23	20
96906	MS35650-302	5310-00-934-9751	C16	41
96906	MS35751-102	5306-01-165-4287	C3	13
96906	MS39086-251	5315-00-531-7881	C10	67
96906	MS51508A4-4	4730-00-606-1989	C16	8
96906	MS51861-14C	5305-00-163-6561	C10	53
96906	MS51967-11	5310-00-880-8189	C3	8
96906	MS51967-5	5310-00-880-7744	C4	23
			C16	45
96906	MS90725-32	5306-00-225-8497	C10	64
			C16	18
96906	MS90725-35	5306-00-225-8500	C10	23
96906	MS90725-6	5305-00-068-0502	C10	72
			C16	17
96906	MS90728-85	5305-00-071-1786	C3	7
81349	MW-C24(7)U5	6145-00-238-6992	C7	7
81349	MW-C24(7)U9	6145-00-548-2974	C7	4
			C17	50
81349	MW-C24/7/U1	6145-00-583-3876	C7	8
81349	MW-C24/7/U6	6145-00-635-0034	C7	3
81349	MWC18-16U0	6145-00-548-2966	C23	35
81349	M16878/12BEB0		C7	5
81349	M16878/12BEB2		C7	6
81349	M16878/12BFB8		C9	3
81349	M16878/12BHD6	6145-00-767-3399	C17	8
81349	M17/113-RG316	6145-00-918-9494	C21	6
81349	M23053/14-003-C	5970-01-209-3592	C14	2
			C15	5
			C17	57
81349	M23053/14-005-C	5970-01-239-8052	C8	7
			C15	4
			C17	85
			C21	5
			C23	12
81349	M23053/14-007-C	5970-01-209-3594	C13	2
			C14	3
			C15	6
			C17	64
81349	M39014-01-1333	5910-00-113-5515	C17	74
81349	M39014/01-1593	5910-00-010-8717	C17	49
81349	M39014/02-1332	5910-00-143-0501	C7	2

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81349	RCR20G10RJ		C17	66
19200	11784430	6130-01-236-0258	C18	4
19200	11784433		C23	5
19200	11784434		C23	38
19200	11784436-1		C23	29
19200	11784436-2		C23	2
19200	11784437	5330-01-236-0291	C23	4
19200	11784438		C23	39
19200	11784440		C23	28
19200	11784441		C10	5
19200	11784442		C5	19
19200	11784443		C5	18
19200	11784444		C23	34
19200	11784445		C23	10
19200	11784446	5950-01-004-2496	C23	8
19200	11784447		C23	37
19200	11784450	6920-01-235-0228	C2	4
19200	11784451	6920-01-224-6371	C8	2
19200	11784452	6920-01-224-6378	C8	8
19200	11784453		C8	1
19200	11784454	5935-01-238-9877	C8	4
19200	11784455	5935-01-235-0294	C8	6
19200	11784456	6920-01-235-0229	C8	9
19200	11784464		C23	17
19200	11784465	6920-01-236-2877	C23	13
19200	11784466-1	6240-01-235-7566	C23	18
19200	11784466-2	6240-01-239-1586	C23	14
19200	11784468		C23	15
19200	11784472		C23	23
19200	11784473	6920-01-201-9854	C3	2
19200	11784474-1	5940-01-195-1753	C15	3
			C23	9
19200	11784475	6920-01-195-1750	C2	3
19200	11784476	6920-01-195-1754	C3	3
19200	11784477	6920-01-202-8849	C3	11
19200	11784480		C3	1
19200	11784481	5365-01-213-2427	C3	12
19200	11784482	5305-01-195-1759	C3	10
19200	11784483	6920-01-202-8848	C3	14
19200	11784484	6920-01-235-0230	C2	6
19200	11784485	6130-01-236-7454	C1	3
19200	11784486		C23	31
19200	11784496	4720-01-235-7571	C17	60
19200	11784498		C23	30
19200	11784501	6920-01-085-8514	C1	2
19200	11784502	6920-01-165-4564	C2	8
19200	11784504	6920-01-203-7820	C10	20
19200	11784506		C10	16
19200	11784507	6920-01-235-0239	C11	4
19200	11784508	6920-01-235-0235	C10	19
19200	11784509	6920-01-235-0236	C10	18

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19200	11784510	6920-01-239-1547	C10	17
19200	11784511	6920-01-195-3539	C15	1
19200	11784512	6920-01-235-1793	C4	10
19200	11784513	6920-01-235-1794	C4	24
19200	11784514	5999-01-239-1611	C16	51
19200	11784520-1		C16	10
19200	11784520-2	6920-01-239-1554	C16	48
19200	11784521	3130-01-235-0295	C10	42
19200	11784522	3130-01-235-0296	C10	54
19200	11784523	5999-01-204-4175	C17	40
19200	11784526	5999-01-204-4176	C17	8
19200	11784529	5930-01-209-8516	C17	28
19200	11784531	5999-01-204-4174	C17	13
19200	11784538		C10	11
19200	11784539		C10	10
19200	11784540	6920-01-235-0231	C10	3
19200	11784541	6920-01-235-0232	C10	4
19200	11784542		C17	27
19200	11784545	5340-01-182-7616	C10	35
19200	11784547	4730-01-195-1758	C10	75
19200	11784548	6920-01-235-0245	C10	37
19200	11784549-1	5305-01-235-1901	C10	41
19200	11784549-2	5305-01-235-1900	C10	34
19200	11784550	6920-01-235-0242	C11	1
19200	11784551		C11	7
19200	11784552	6920-01-235-0240	C11	6
19200	11784553	6920-01-235-0241	C11	5
19200	11784554	6920-01-238-9870	C11	8
19200	11784555-1	5305-01-236-0306	C6	12
			C20	4
19200	11784555-3	5305-01-235-1899	C17	38
19200	11784555-4	5305-01-235-1898	C17	7
			C19	18
			C20	6
19200	11784555-5	5305-01-239-1595	C19	39
19200	11784555-6	5305-01-236-0307	C19	22
19200	11784559-2	5940-01-213-2458	C9	7
			C17	59
19200	11784560-1	6920-01-238-9869	C9	6
19200	11784560-2		C13	1
			C14	1
			C15	8
19200	11784560-3	6145-01-214-4016	C17	65
19200	11784565-1	6145-00-316-9039	C17	86
19200	11784567-2		C19	28
19200	11784567-4		C10	12
19200	11784568-1	5310-01-236-7461	C19	35
19200	11784568-2	5310-01-236-0265	C19	23
19200	11784569-2	5310-01-236-0325	C19	30
19200	11784569-4	6920-01-236-0170	C19	26
19200	11784570-1	5310-01-236-0332	C6	13

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			C20	3
19200	11784570-2	5310-01-236-0336	C19	24
19200	11784572-1	5305-01-239-1596	C21	16
19200	11784572-2	5305-01-238-9876	C10	29
19200	11784574-2	5305-01-236-0300	C19	8
19200	11784574-4	5305-01-236-0301	C21	8
19200	11784575	5305-01-235-1902	C5	17
19200	11784576-2	5305-01-235-0289	C8	5
19200	11784577	5305-01-235-1903	C6	7
19200	11784578	5310-01-236-0297	C19	32
19200	11784599	5330-01-238-9874	C8	3
19200	11784605	6920-01-235-0238	C10	21
19200	11784606	5340-01-238-9879	C10	1
19200	11784607	6920-01-235-0237	C10	24
19200	11784608	6920-01-235-0244	C10	8
19200	11784609	6920-01-235-0243	C10	26
19200	11784610	6920-01-235-1788	C10	25
19200	11784611	6920-01-235-0234	C10	33
19200	11784613	6920-01-238-9871	C10	57
19200	11784617	6920-01-195-1749	C10	69
19200	11784618	5310-01-210-1588	C10	73
19200	11784619-1	6920-01-235-1760	C10	74
19200	11784619-10		C12	1
19200	11784619-11	6920-01-235-1766	C12	6
19200	11784619-12		C12	14
19200	11784619-13		C12	7
19200	11784619-14		C12	12
19200	11784619-15	6920-01-235-1767	C12	9
19200	11784619-16		C12	11
19200	11784619-17		C12	8
19200	11784619-18		C12	13
19200	11784619-19	6920-01-235-1762	C12	10
19200	11784619-2	6920-01-235-1763	C12	3
19200	11784619-3	6920-01-235-1761	C12	2
19200	11784619-4		C12	18
19200	11784619-5		C12	17
19200	11784619-6		C12	16
19200	11784619-7		C12	15
19200	11784619-8	6920-01-235-1764	C12	4
19200	11784619-9	6920-01-235-1765	C12	5
19200	11784621		C10	43
19200	11784622	6920-01-235-0246	C10	63
19200	11784623	6920-01-235-0247	C10	46
19200	11784624	6920-01-235-0249	C10	62
19200	11784625	6920-01-235-0248	C10	51
19200	11784626		C10	28
19200	11784627		C10	70
19200	11784628	5365-01-213-2426	C17	41
19200	11784629	5330-01-213-2421	C17	32
19200	11784630	6920-01-239-1555	C17	24

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19200	11784631	5935-01-195-1761	C17	22
19200	11784632		C17	18
19200	11784633		C17	1
19200	11784634	5330-01-211-1342	C17	44
19200	11784635	6920-01-216-2560	C17	37
19200	11784636	7690-01-209-8655	C17	19
19200	11784637	6920-01-214-6249	C17	15
19200	11784638	5305-01-211-1377	C17	25
19200	11784639	5310-01-210-1605	C17	39
19200	11784640	6210-01-214-6430	C17	33
19200	11784641	5340-01-209-7818	C17	51
19200	11784642	5999-01-209-3017	C17	6
19200	11784643	5999-01-207-9711	C17	9
19200	11784644-1	5365-01-214-6400	C17	62
19200	11784644-2	5365-01-217-2088	C17	17
19200	11784644-3	5365-00-726-2038	C17	14
19200	11784645	5365-01-207-5755	C4	3
			C16	2
			C17	45
19200	11784646	9390-01-216-9346	C17	70
19200	11784647	6850-01-218-0679	C17	83
19200	11784648	5945-01-207-9434	C17	67
19200	11784649	6920-01-209-2983	C17	61
19200	11784652	5355-01-195-1757	C17	23
19200	11784657-1	5935-01-208-1990	C17	72
19200	11784657-2	6920-01-224-6370	C17	71
19200	11784658-1	5935-01-238-7770	C17	63
19200	11784658-2	5935-00-563-1173	C17	82
19200	11784661	5935-01-235-7568	C17	84
19200	11784662	5935-01-207-8376	C15	7
19200	11784663	5935-01-094-9306	C17	75
19200	11784664	5935-01-238-9878	C9	4
19200	11784665	5935-01-207-8380	C17	77
19200	11784667		C17	30
19200	11784669-1	5340-00-282-7965	C17	10
19200	11784669-2	5340-01-054-8824	C10	58
19200	11784669-3	5340-01-236-4105	C17	11
19200	11784669-4	5340-01-117-7702	C17	12
19200	11784670	5910-01-207-3566	C17	3
19200	11784671	5910-00-649-4121	C17	2
19200	11784700		C1	1
19200	11784701	6920-01-235-7564	C18	2
19200	11784702-1		C18	3
19200	11784702-10		C18	3
19200	11784702-2		C18	3
19200	11784702-3		C18	3
19200	11784702-4		C18	3
19200	11784702-5		C18	3
19200	11784702-6		C18	3
19200	11784702-7		C18	3
19200	11784702-8		C18	3

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19200	11784703		C18	5
19200	11784704	5985-01-236-0263	C18	1
19200	11784705	6685-01-239-1597	C19	1
19200	11784706	6920-01-239-1563	C19	19
19200	11784707		C19	41
19200	11784708	6920-01-239-1564	C19	15
19200	11784709		C19	11
19200	11784710	5999-01-239-1594	C19	38
19200	11784711-2	5999-01-236-0425	C19	5
19200	11784714	6920-01-239-1572	C19	4
19200	11784717	6140-01-239-1585	C19	17
19200	11784718		C19	3
19200	11784719	6920-01-236-0429	C20	2
19200	11784722		C20	1
19200	11784723		C21	3
19200	11784724	5340-01-236-0354	C19	33
19200	11784725		C19	7
19200	11784726	5315-01-239-1601	C19	6
19200	11784727	5305-01-236-0309	C19	14
19200	11784728-1	5340-01-236-0342	C19	9
19200	11784728-2	5340-01-236-0343	C19	29
19200	11784729		C19	10
19200	11784730	5365-01-236-0322	C19	31
19200	11784744	5330-01-239-1593	C19	25
19200	11784745	5340-01-236-0292	C19	34
19200	11784746	6920-01-236-0371	C19	37
19200	11784747	6920-01-239-1571	C21	15
19200	11784748		C19	2
19200	11784750	6250-01-239-1599	C21	21
19200	11784751		C21	19
19200	11784752		C21	20
19200	11784766		C19	21
19200	11784767	6920-01-236-0171	C19	20
19200	11784768		C22	1
19200	11784769	5310-01-239-1587	C22	2
19200	11784770	5935-01-236-0418	C22	4
19200	11784771		C21	14
19200	11784772	6920-01-239-1565	C21	17
19200	11784773	6920-01-236-0195	C21	1
19200	11784774	5340-01-239-1568	C21	2
19200	11784775	5310-01-239-1567	C21	13
19200	11784776	5310-01-239-1570	C21	4
19200	11784777	5310-01-239-1566	C21	18
19200	11784778	9905-01-236-0196	C21	10
19200	11784779	9905-01-239-1603	C21	11
19200	11784780	5310-01-239-1569	C21	12
19200	11784781	6920-01-236-0197	C21	9
19200	11784782	6920-01-236-0194	C20	5
19200	11784789		C19	12
19200	11784790		C19	27

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19200	11784801	6920-01-165-4563	C2	7
19200	11784802		C5	1
19200	11784803	6920-01-235-1807	C5	12
19200	11784804		C5	2
19200	11784805	6920-01-236-0428	C6	10
19200	11784808	5999-01-236-4130	C5	14
19200	11784811	5999-01-236-4129	C5	15
19200	11784814	6920-01-235-1808	C5	4
19200	11784817	5999-01-235-1967	C5	5
19200	11784819	6920-01-235-1803	C6	6
19200	11784820		C6	3
19200	11784821	3040-01-236-0368	C6	11
19200	11784822	6920-01-235-1800	C6	8
19200	11784823	6920-01-235-1804	C6	2
19200	11784824	6920-01-235-1799	C6	1
19200	11784825		C6	9
19200	11784826	6920-01-235-1802	C6	14
19200	11784827		C6	15
19200	11784828	6920-01-235-1801	C6	4
19200	11784829	5365-01-236-0394	C6	5
19200	11784837	6920-01-235-1805	C5	3
19200	11784845		C22	3
19200	11784849-1	5330-01-236-0287	C19	13
19200	11784849-6	5330-01-235-1870	C5	8
19200	11784850	5935-00-937-2782	C21	7
19200	11785164	5330-01-239-1592	C19	16
94433	60839	6920-01-235-1774	C16	11
94433	61143	5340-01-235-1960	C16	12
94433	61420	6920-01-235-1780	C16	15
94433	62427	6920-01-235-1783	C16	14
94433	66657		C16	13
94433	68080	6920-01-235-1781	C16	16
19200	9375562	6920-01-235-1759	C9	5
19200	9375712	6150-01-235-1975	C16	25
19200	9375713	6150-01-235-1974	C16	47
19200	9375714	6150-01-235-1976	C16	50
19200	9375717	6920-01-239-1549	C4	15
			C16	39
19200	9375718	6920-01-239-1550	C4	16
			C16	35
19200	9375720	5920-01-209-2989	C16	30
19200	9375721	6920-01-235-1795	C4	7
19200	9375722	6920-01-235-1797	C4	8
19200	9375723	6920-01-235-1796	C4	6
19200	9375724	5330-01-235-1876	C4	5
19200	9375725	6920-01-235-7563	C5	16
19200	9375727		C16	26
19200	9375728	6920-01-235-1792	C4	13
19200	9375729	5310-01-235-1922	C4	17
			C16	36
19200	9375730	6920-01-239-1551	C16	29

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19200	9375732	5330-01-235-0285	C10	2
19200	9375733	6920-01-235-1798	C4	4
19200	9375734	6145-01-239-6988	C2	1
19200	9375736	6920-01-238-8184	C10	32
19200	9375737	6145-01-238-9872	C2	2
19200	9375738		C4	12
19200	9375739		C4	1
19200	9375740		C16	1
19200	9375741	6920-01-235-1790	C4	2
19200	9375742	6920-01-235-1806	C5	11
19200	9375743	5330-01-235-1875	C16	6
19200	9375746	6920-01-235-1771	C16	7
19200	9375747	6920-01-235-1768	C10	66
19200	9375748	6920-01-235-1770	C16	9
19200	9375750	5995-01-236-7458	C5	8
19200	9375751	6920-01-239-1552	C16	31
19200	9375752	6920-01-235-1772	C16	20
19200	9375753		C16	46
19200	9375754		C16	22
19200	9375755-1	5340-01-217-1200	C4	22
19200	9375755-3	5315-01-235-0283	C4	21
19200	9375756	6920-01-235-1789	C2	5
19200	9375757	5305-01-235-1895	C16	44
19200	9375758	6920-01-239-1548	C10	71
19200	9375759		C10	40
19200	9375760	4730-01-190-3269	C16	23
19200	9375761	6920-01-235-0233	C10	38
19200	9375764	6920-01-235-1758	C1	2
19200	9375765	6920-01-235-1791	C4	20

APPENDIX D

EXPENDABLE/DURABLE SUPPLIES

D-1 SCOPE. This appendix lists expendable supplies and materials you will need to operate and maintain the THM/TG. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (except Medical, Class V, Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

D-2. EXPLANATION OF COLUMNS.

a. Column (1) - Item number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 5, App. D").

b. Column (2) - Level. This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew
O - Organizational Maintenance
F - Direct Support Maintenance
H - General Support Maintenance

c. Column (3) - National Stock Number. This is the National Stock Number assigned to the item; use it to request or requisition the item.

d. Column (4) - Description. Indicates the Federal item name and if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parenthesis followed by the part number.

e. Column (5) - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Table D-1. List of Expendable/Durable Supplies

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	F	8030-00-964-7537	Compound Sealing (81349) MIL-S-22473 DC	Ea
2	O	6810-00-543-7415	Alcohol, Denatured (81348) O-E-760	Gal
3	O	9150-00-273-2389	Lubricating Oil, General Purpose (81348) VV-L-800	Oz
4	O	5350-00-192-5047	Cloth, Abrasive (81348) A-A-1048	Ea
5	O	8305-00-273-1800	Waste, Matted Yarns, Wiping (81348) DDD-W-101	Lb
6	O	9150-00 18606685	Hydraulic Fluid, Petroleum Base (81349) MIL-L-46152	Dr
7	O	9150-00-265-9408	Hydraulic Fluid, Petroleum Base (81349) MIL-H-5606	Dr
8	F	3439-00 453-5472	Solder, Tin Alloy (81348) SN60WRMAP2 0.036	Lb
9	O	8010-00 297-2124	Paint, OD FED-STD-595	Gal
10		6505-00 133-8025	Petroleum, White, ASP 92469	CN

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2-8			2-1	Preventive Maintenance Checks and Services. Item 7 under "Items to be inspected" should be changed to read as follows: Firing linkage and firing mechanism pawl
12	1-6a			Since there are both 20- and 30- round magazines for this rifle, data on both should be listed

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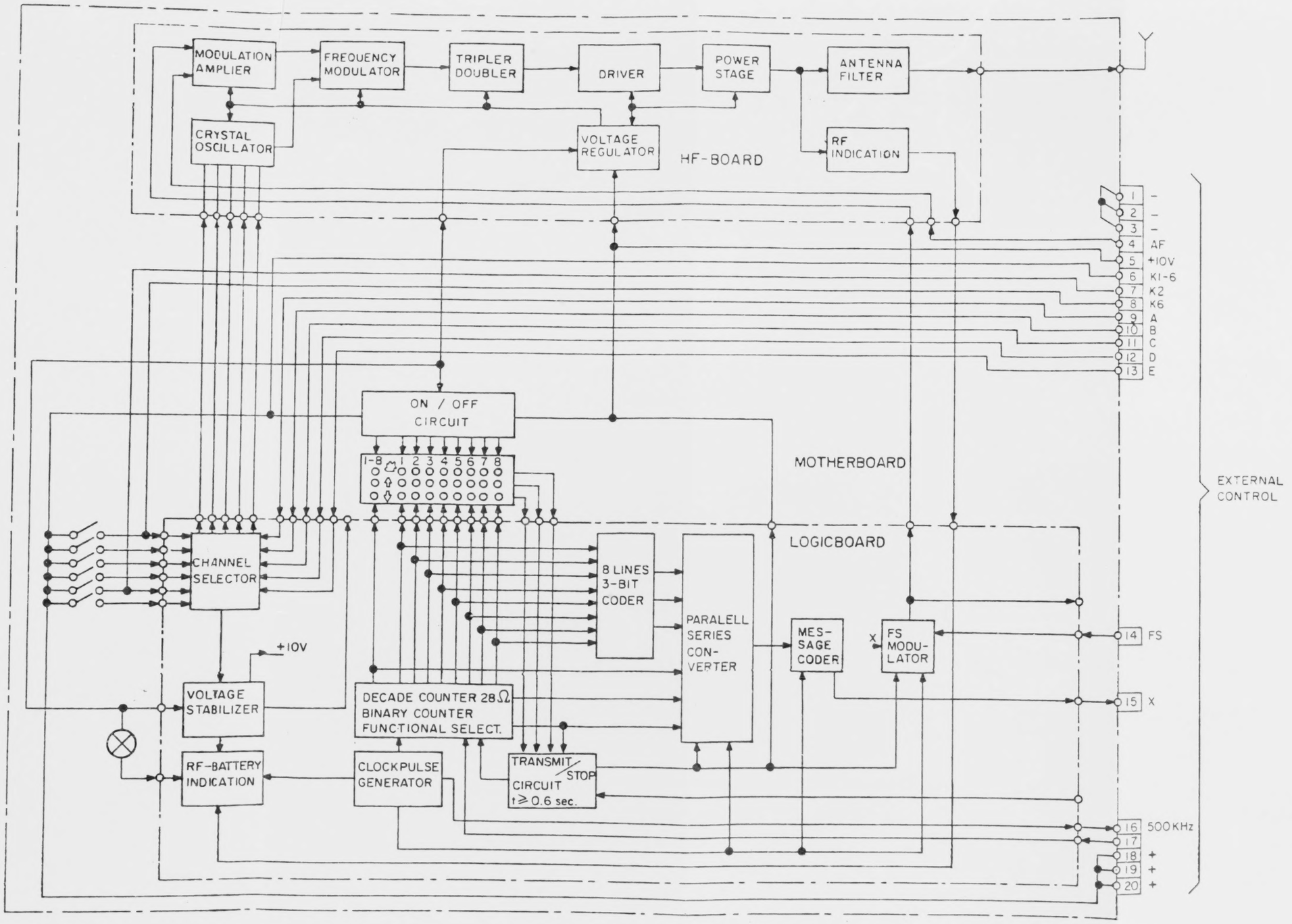


Figure FO-1. OCD Block Diagram

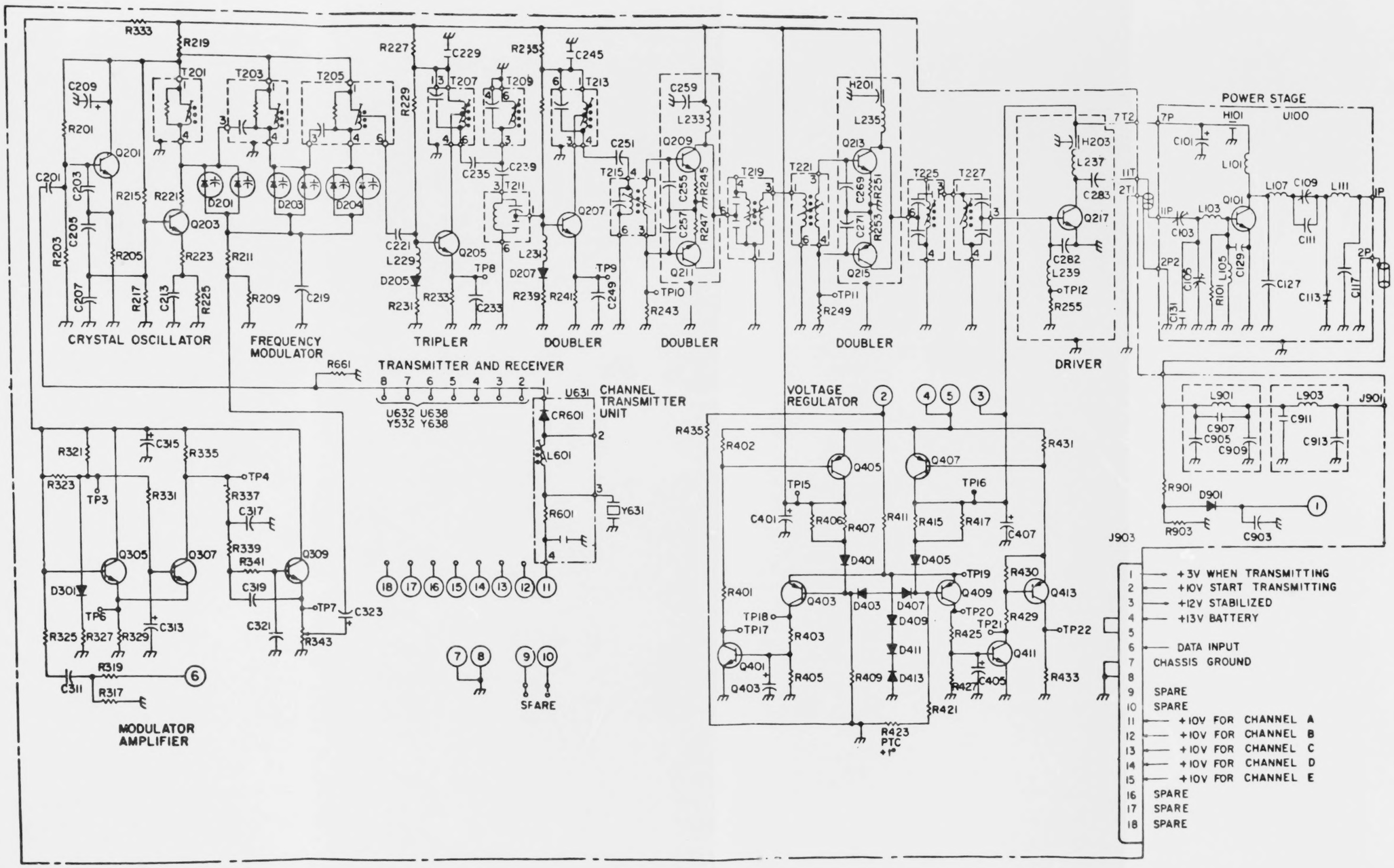


Figure FO-2. OCD/Transmitter HF CCA Schematic Diagram

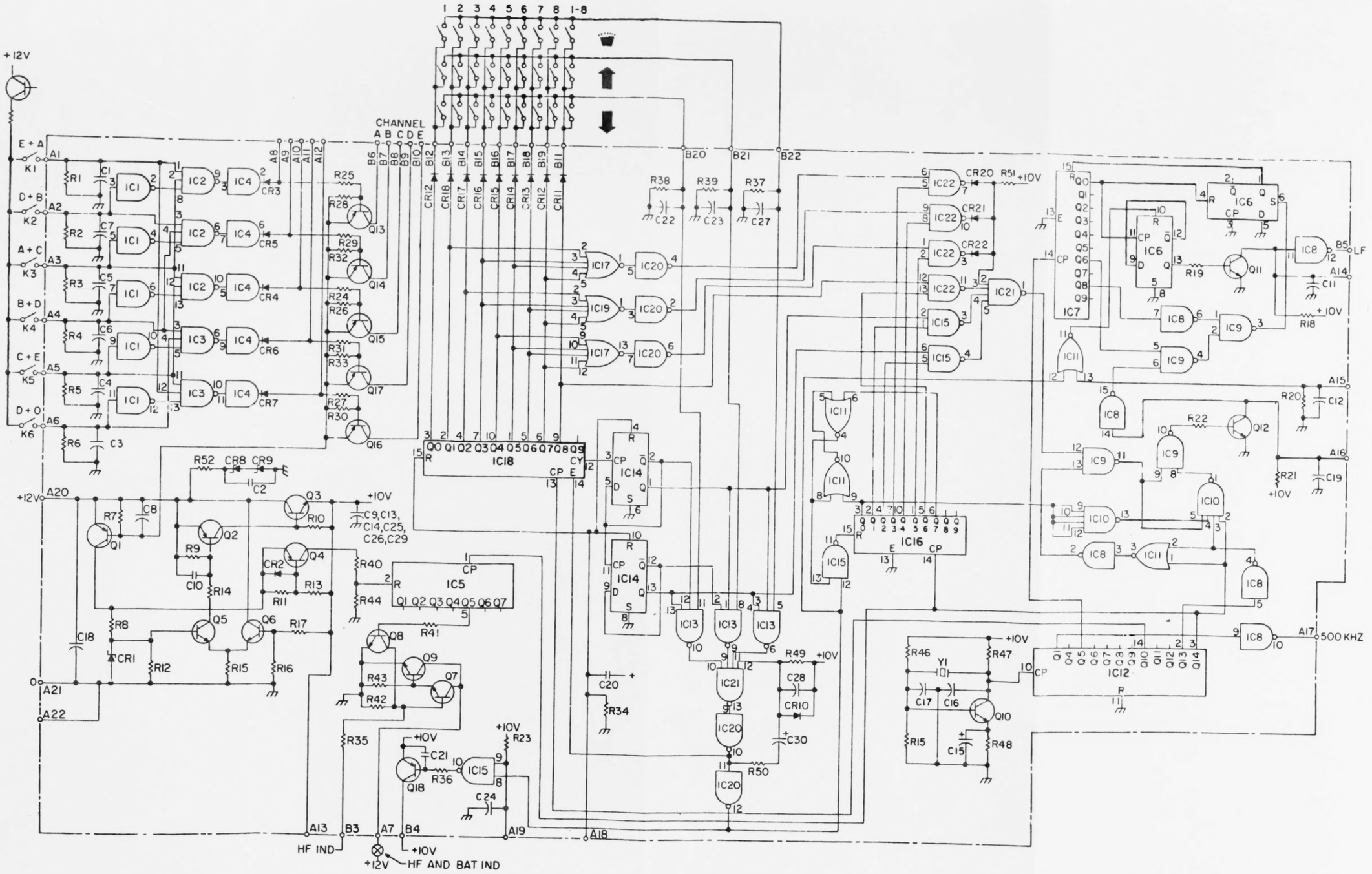


Figure FO-3. OCD/Transmitter Logic CCA Schematic Diagram

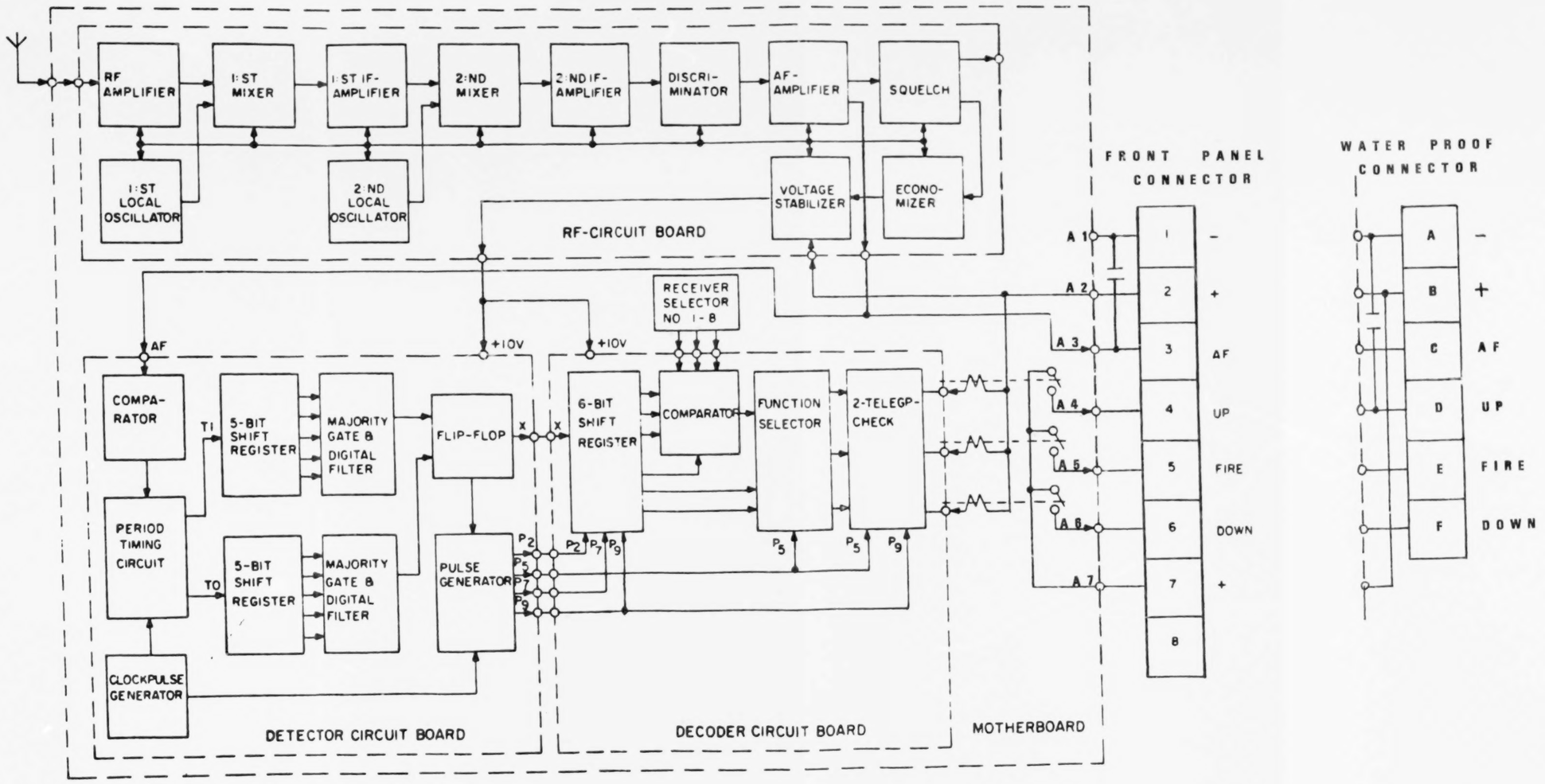


Figure FO-4. Radio Receiver Block Diagram

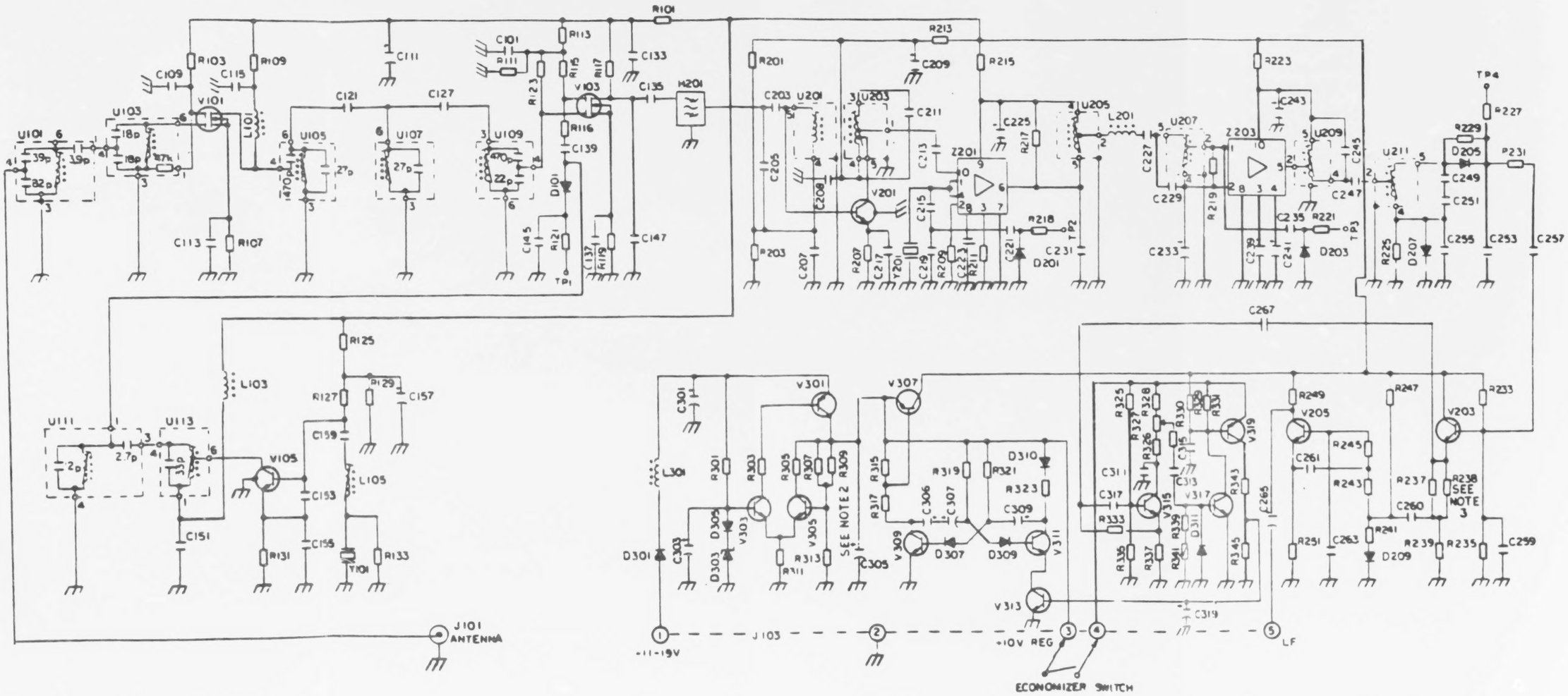


Figure FO-5. Receiver High Frequency CCA

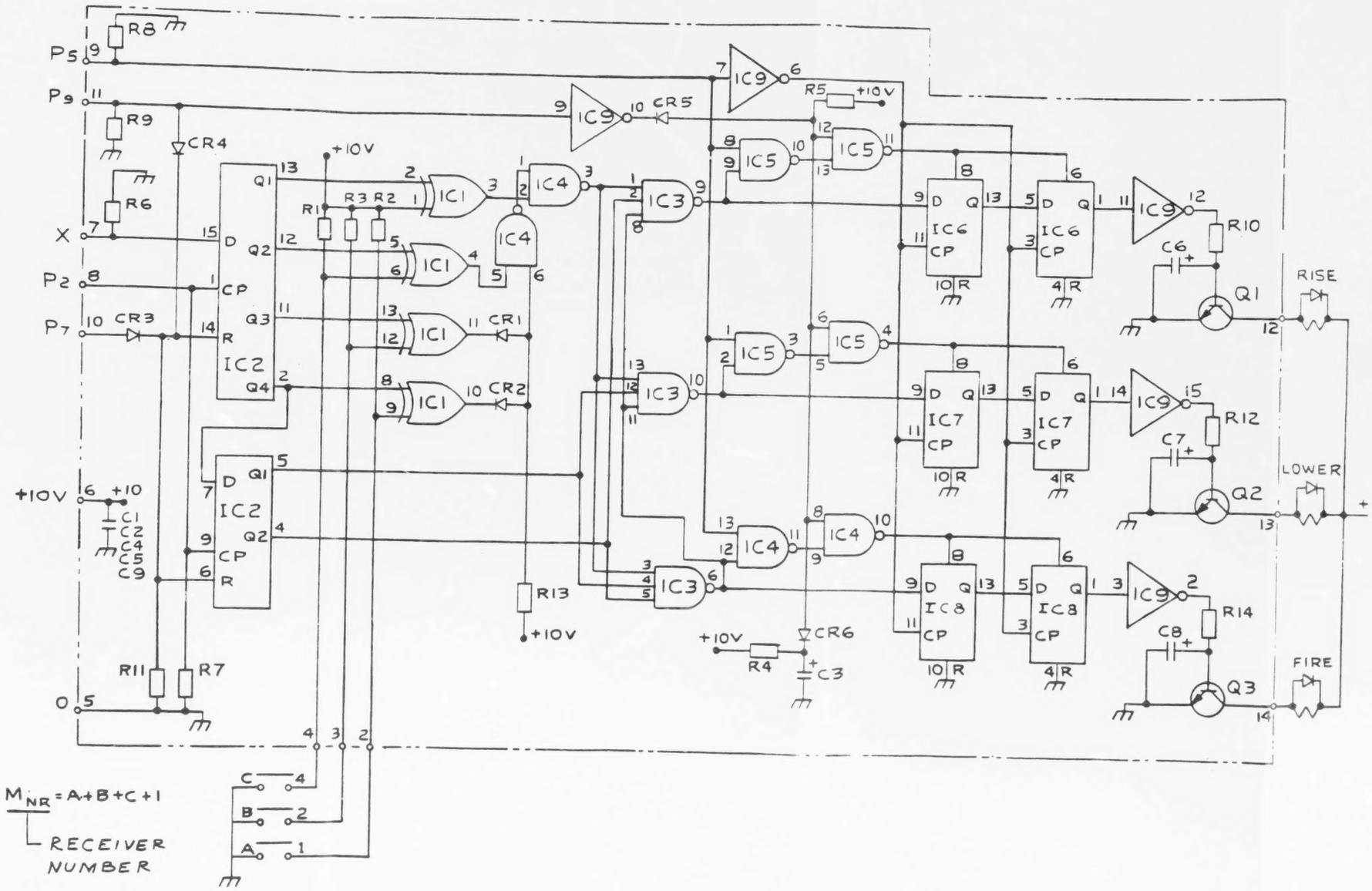


Figure FO-6. Receiver Decoder CCA

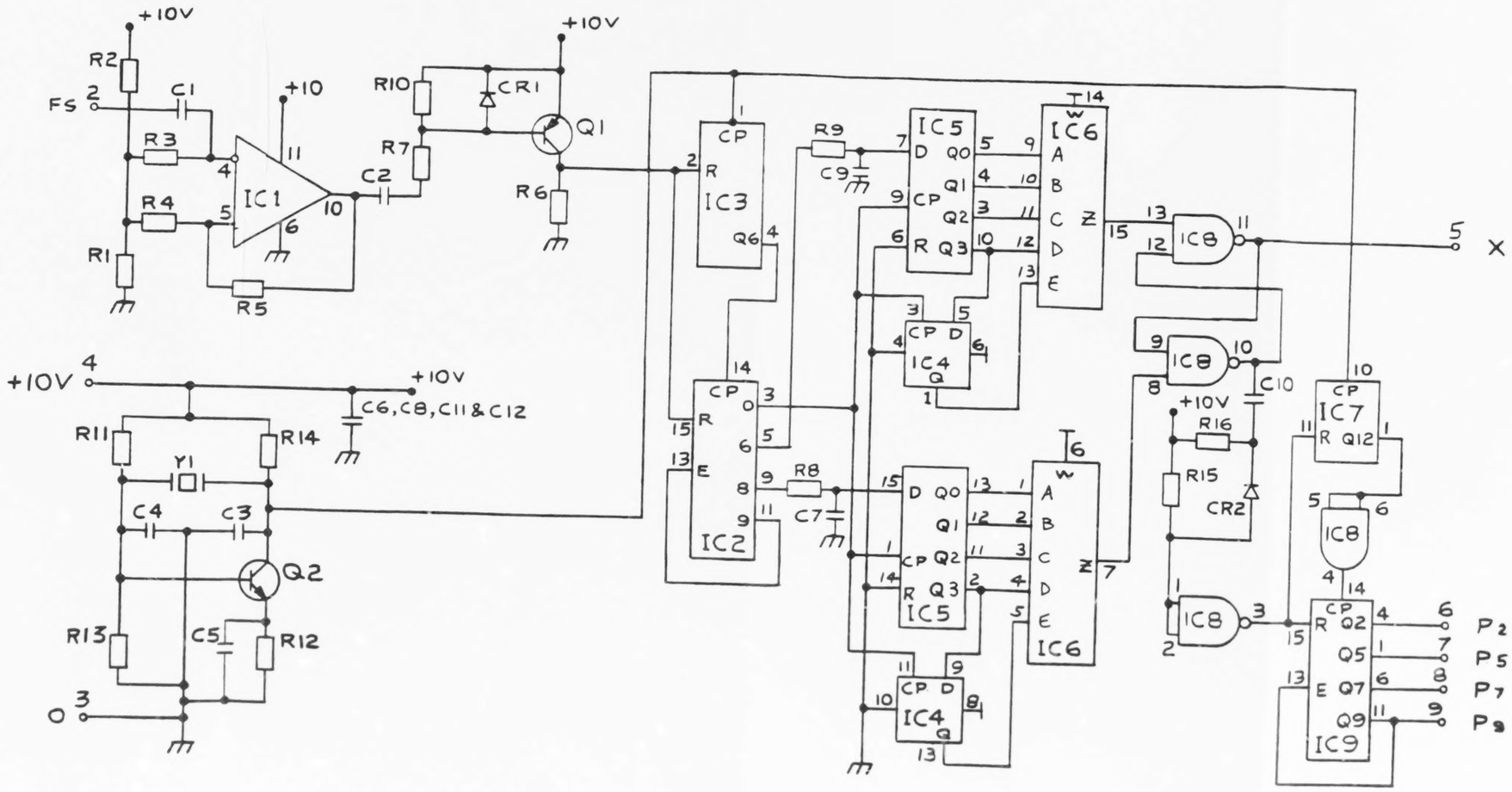
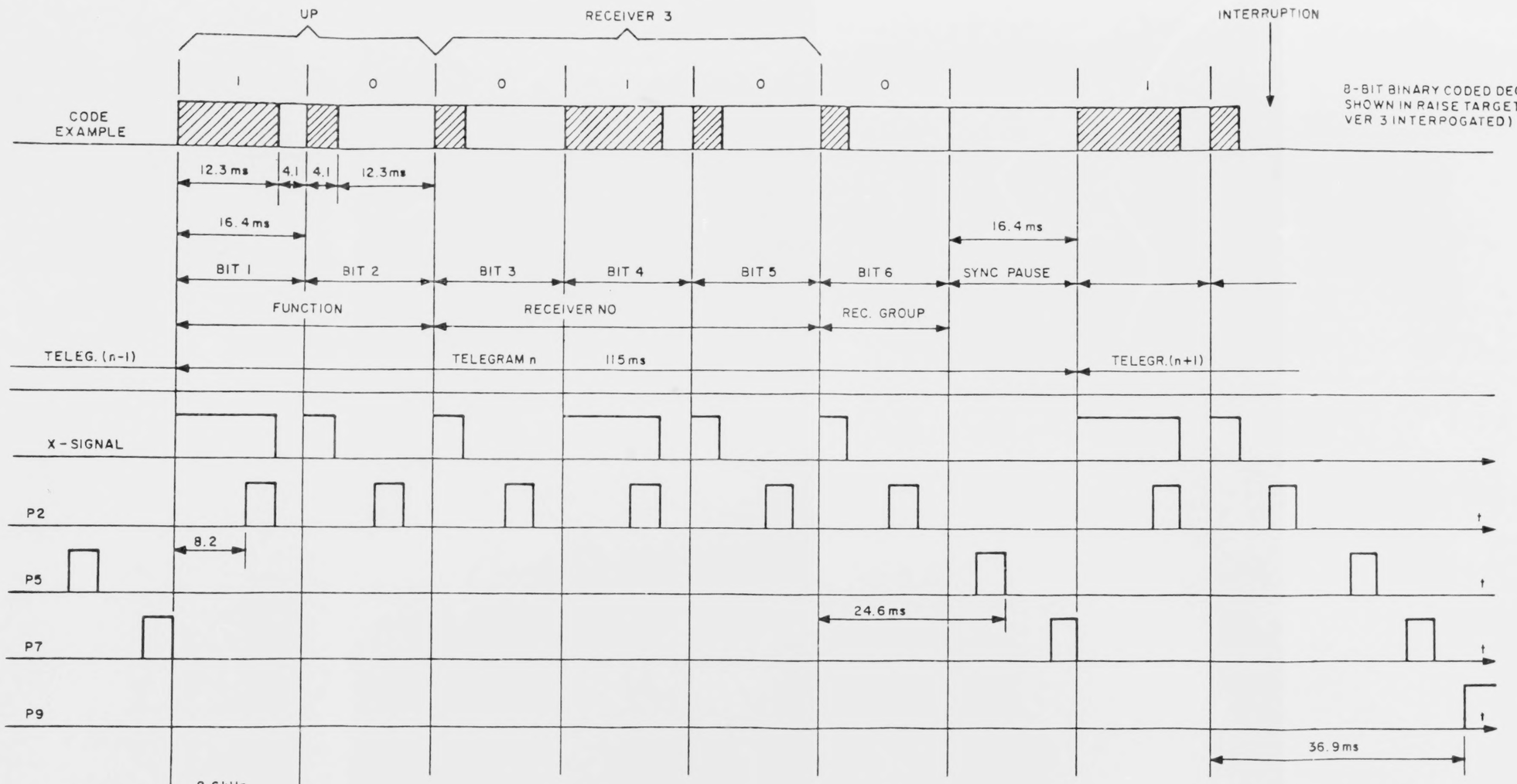


Figure FO-7. Receiver Detector CCA



FUNC	BIT 1	BIT 2
—	0	0
✸	1	1
↑	1	0
↓	0	1

REC.	BIT 3	BIT 4	BIT 5	BIT 6
1	0	0	0	0
2	1	0	0	0
3	0	1	0	0
4	1	1	0	0
5	0	0	1	0
6	1	0	1	0
7	0	1	1	0
8	1	1	1	0
1-8	0	0	0	1

Figure FO-8. Characteristics of Transmitter Message and Detector Pulses

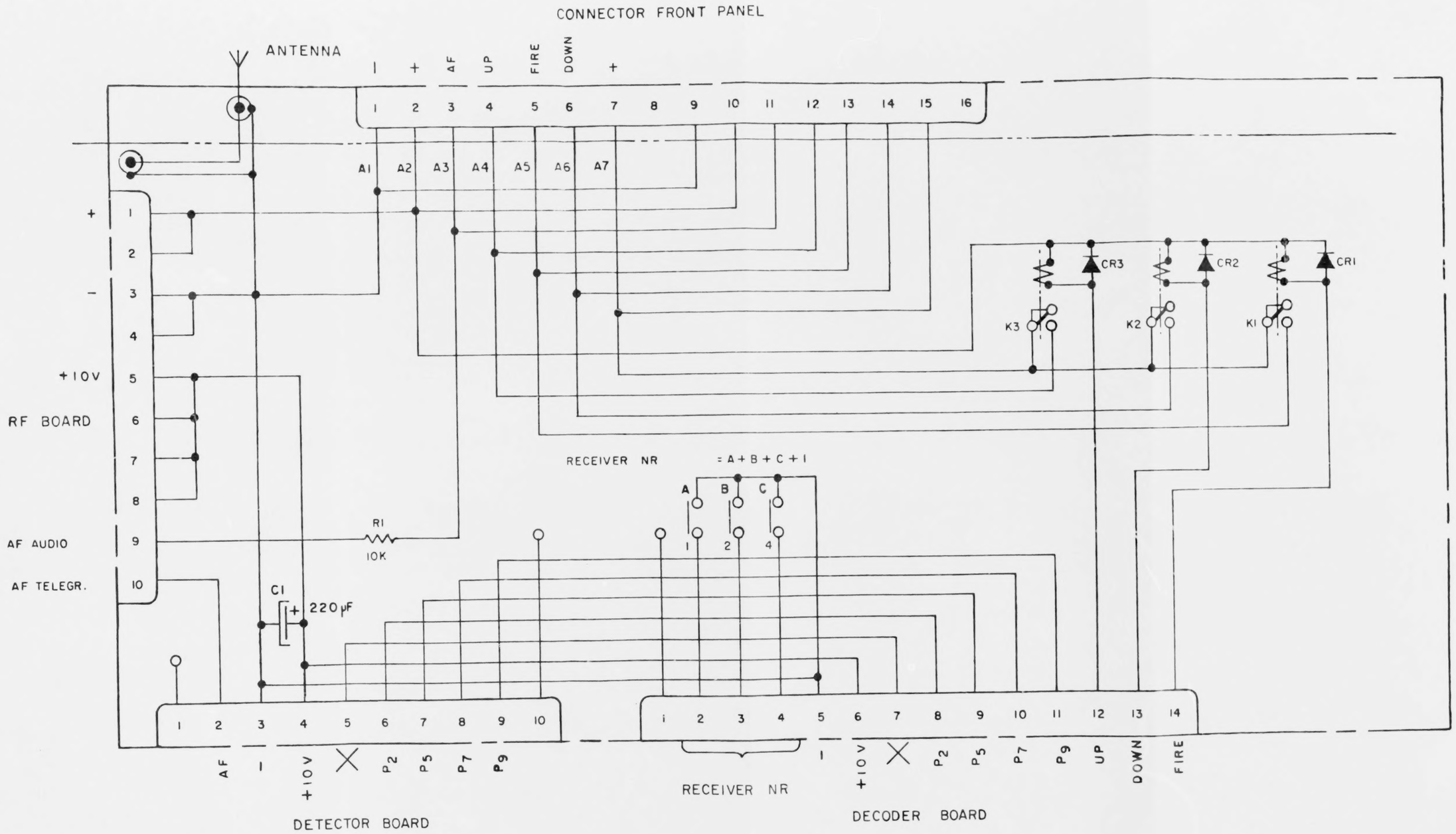


Figure FO-9. Receiver Mother-Board (Front Panel Connector) (Sheet 1 of 2)

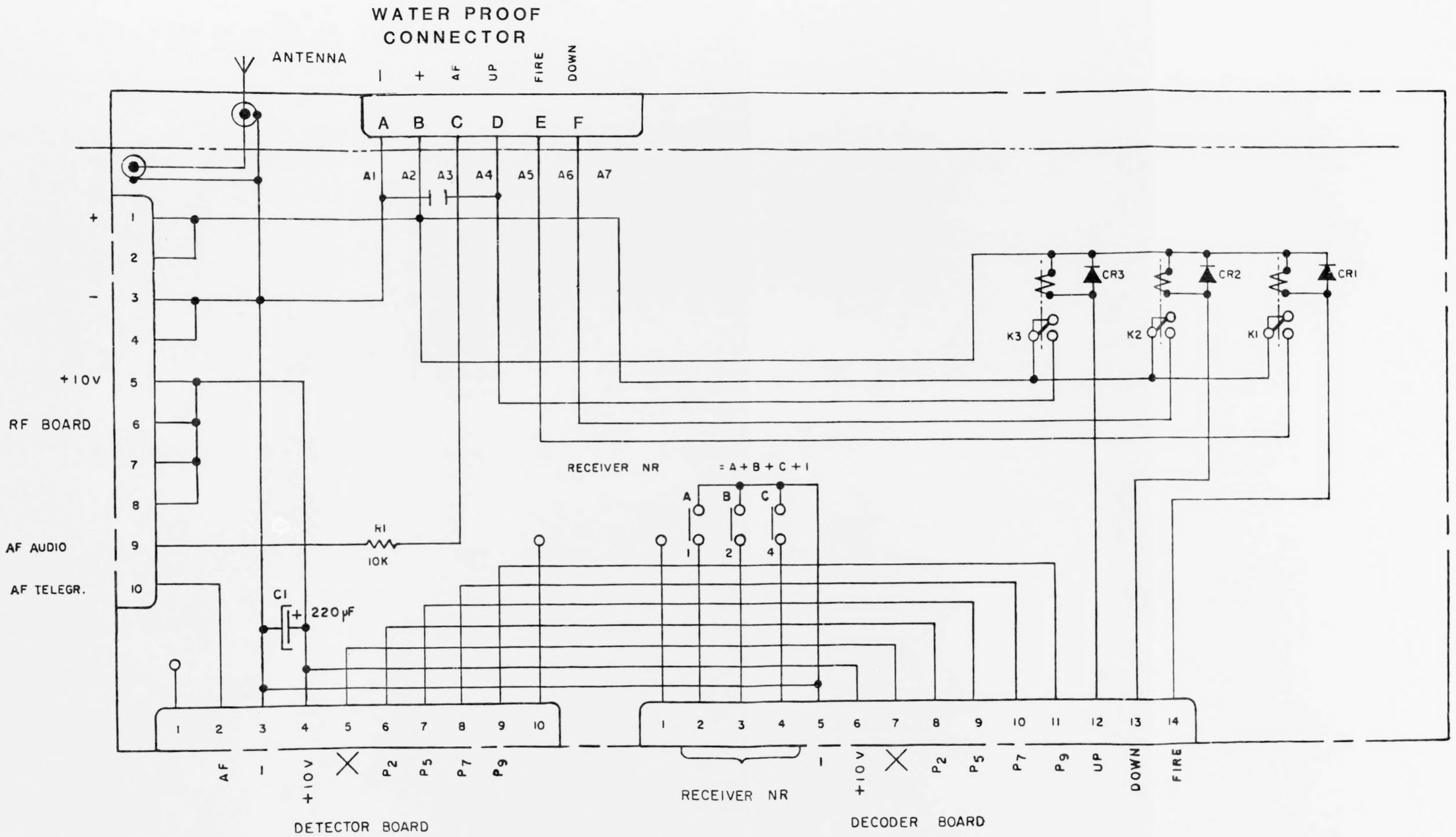


Figure FO-9. Receiver Mother-Board (Waterproof Connector) (Sheet 2 of 2)

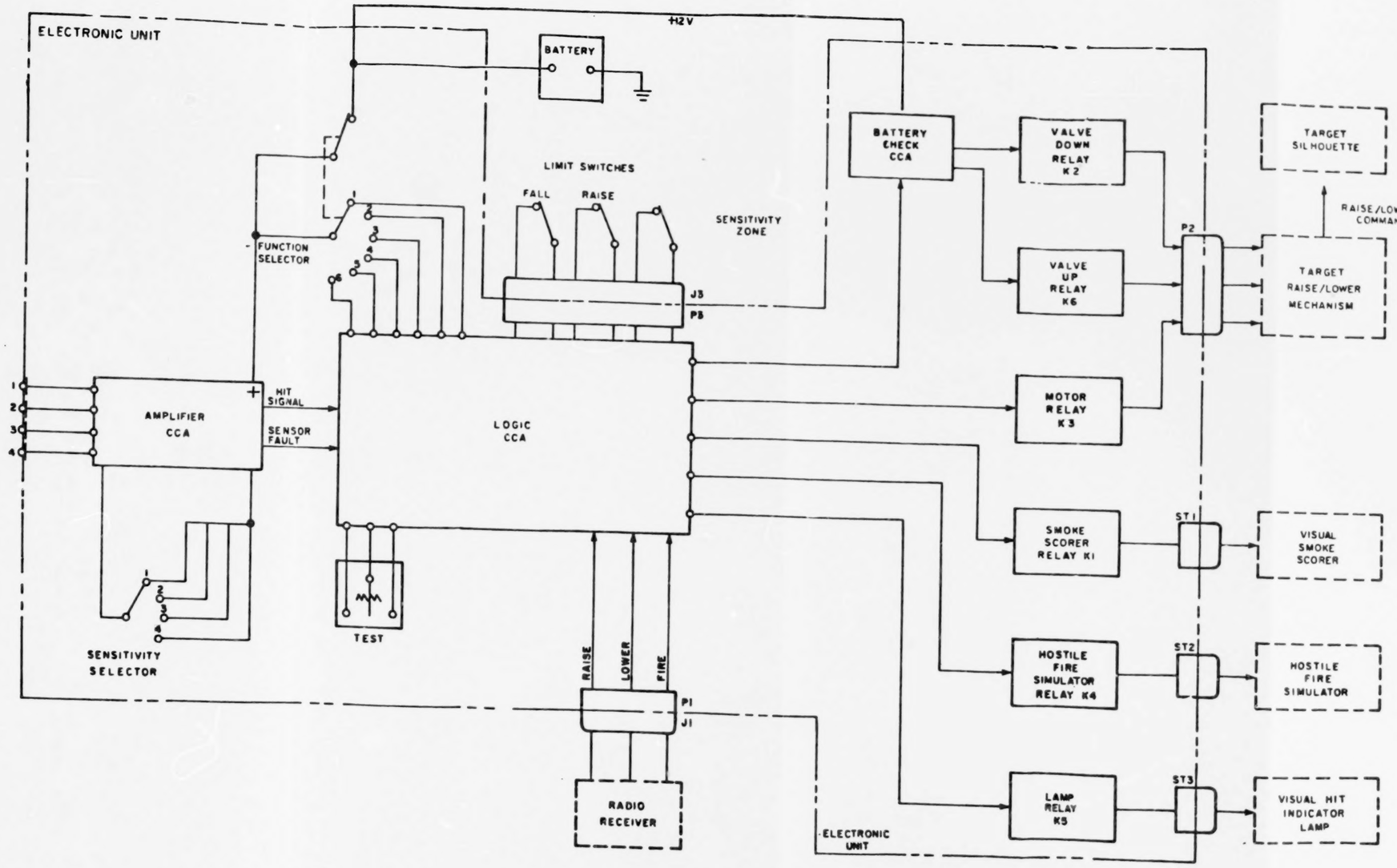


Figure FO-10. THM/TG Electronic Control Unit Block Diagram

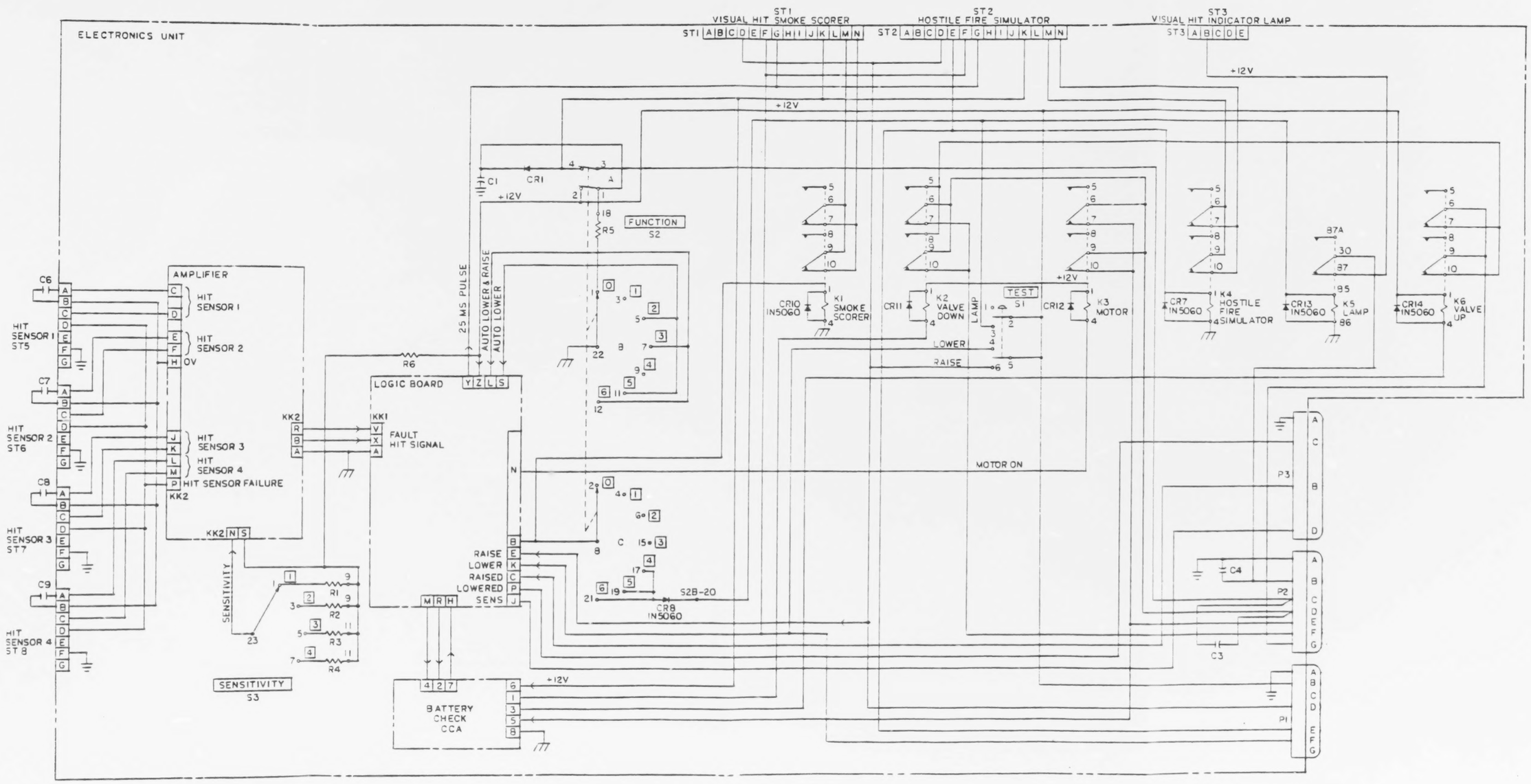


Figure FO-11. THM/TG Target Device Schematic Diagram (Sheet 1 of 2)

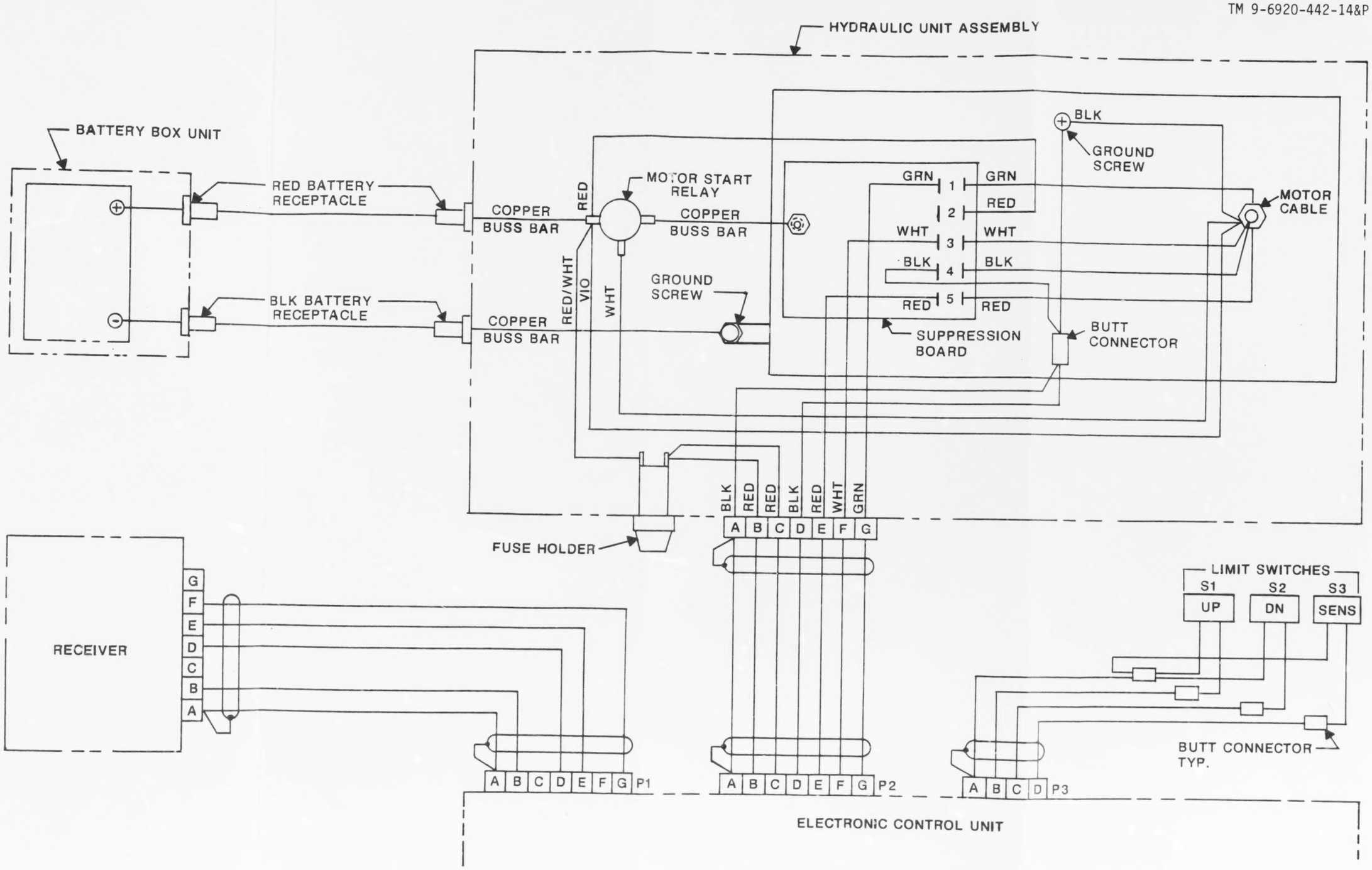


Figure FO-11. THM/TG Target Device Schematic Diagram (Sheet 2 of 2)

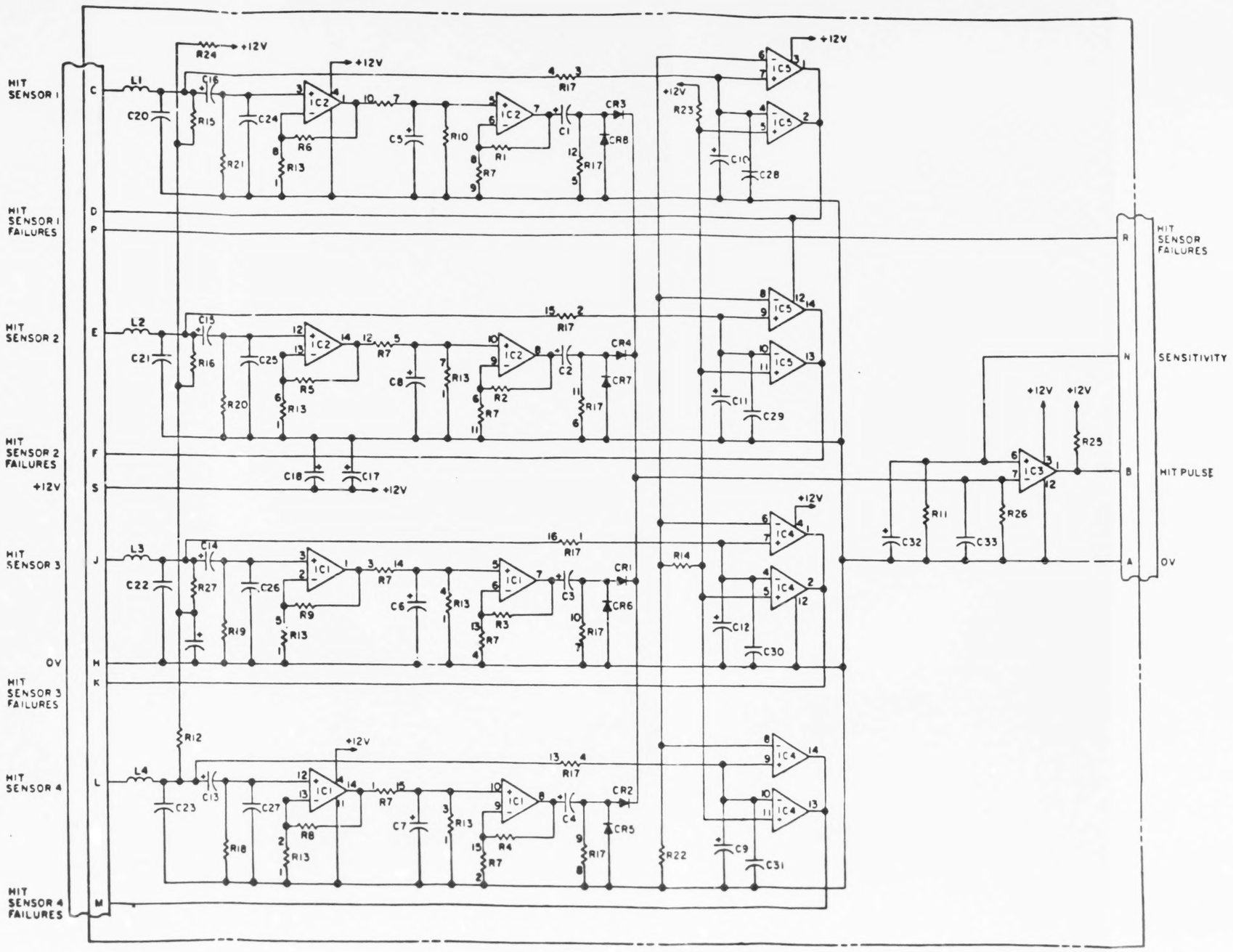


Figure FO-12. THM/TG Electronic Control Unit Amplifier CCA, Schematic Diagram

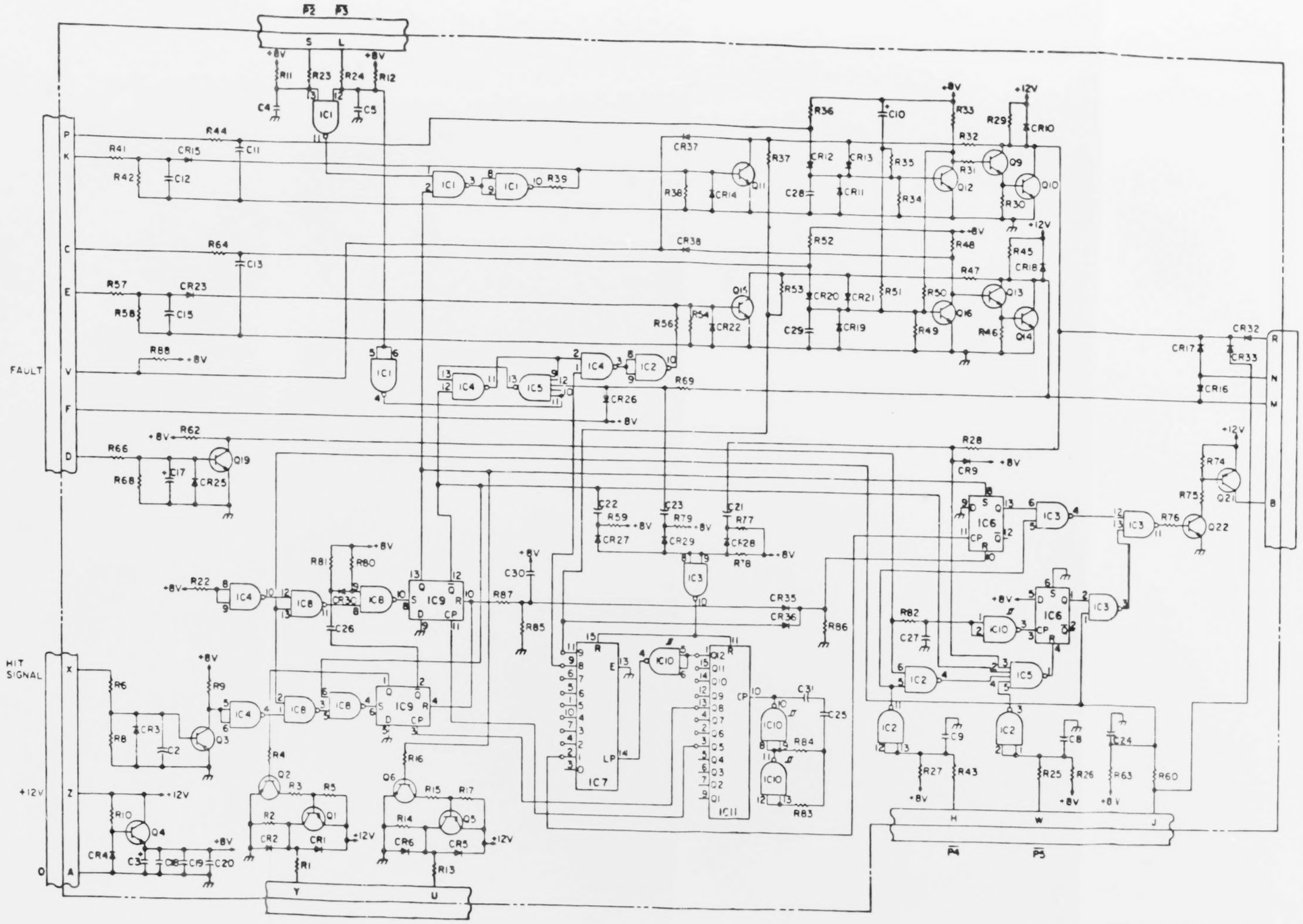


Figure FO-13. THM/TG Electronic Control Unit Logic CCA, Schematic Diagram

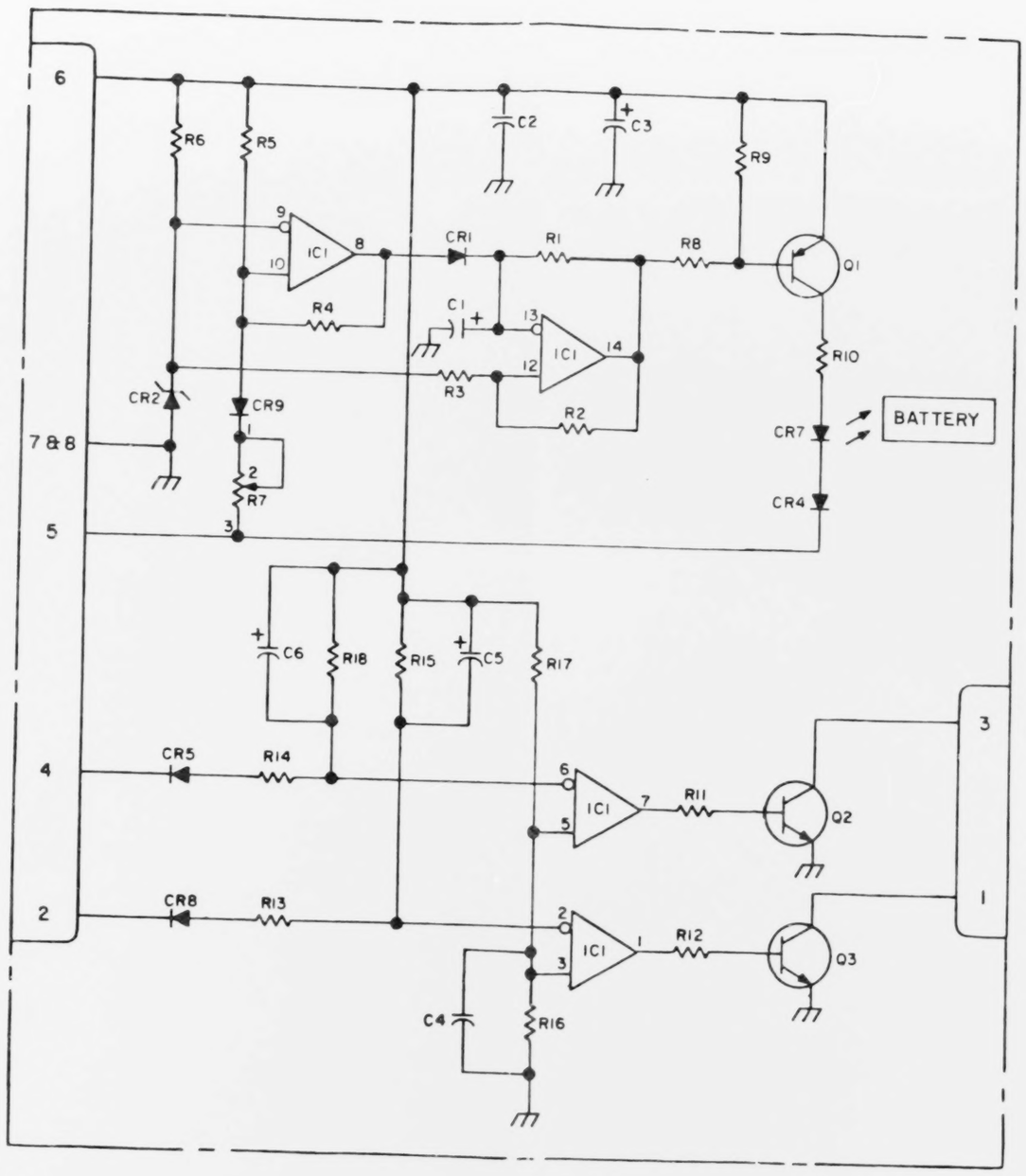


Figure FO-14. THM/TG Electronic Control Unit Battery Check CCA, Schematic Diagram

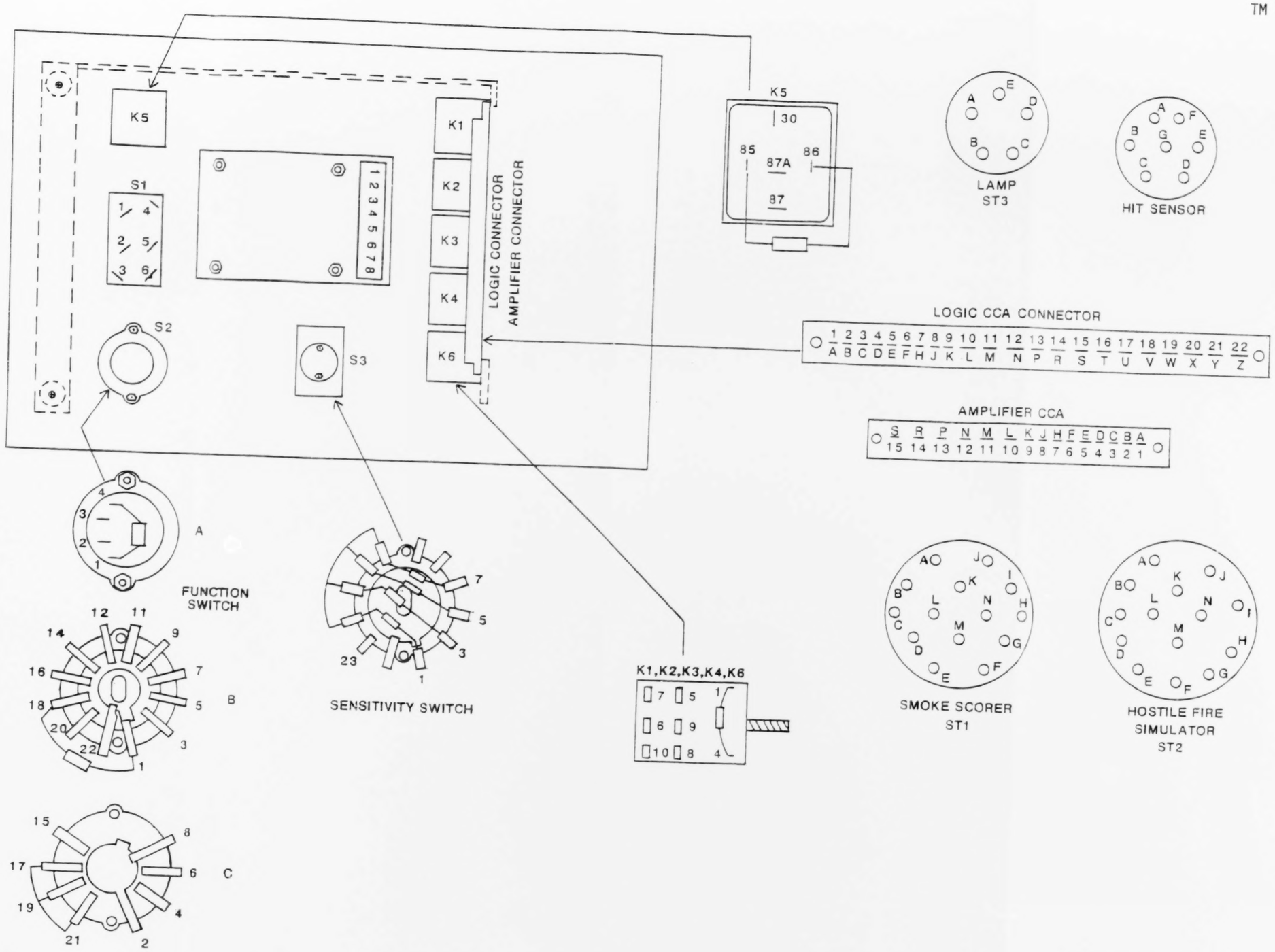


Figure FO-15. Electronic Control Unit Component Location

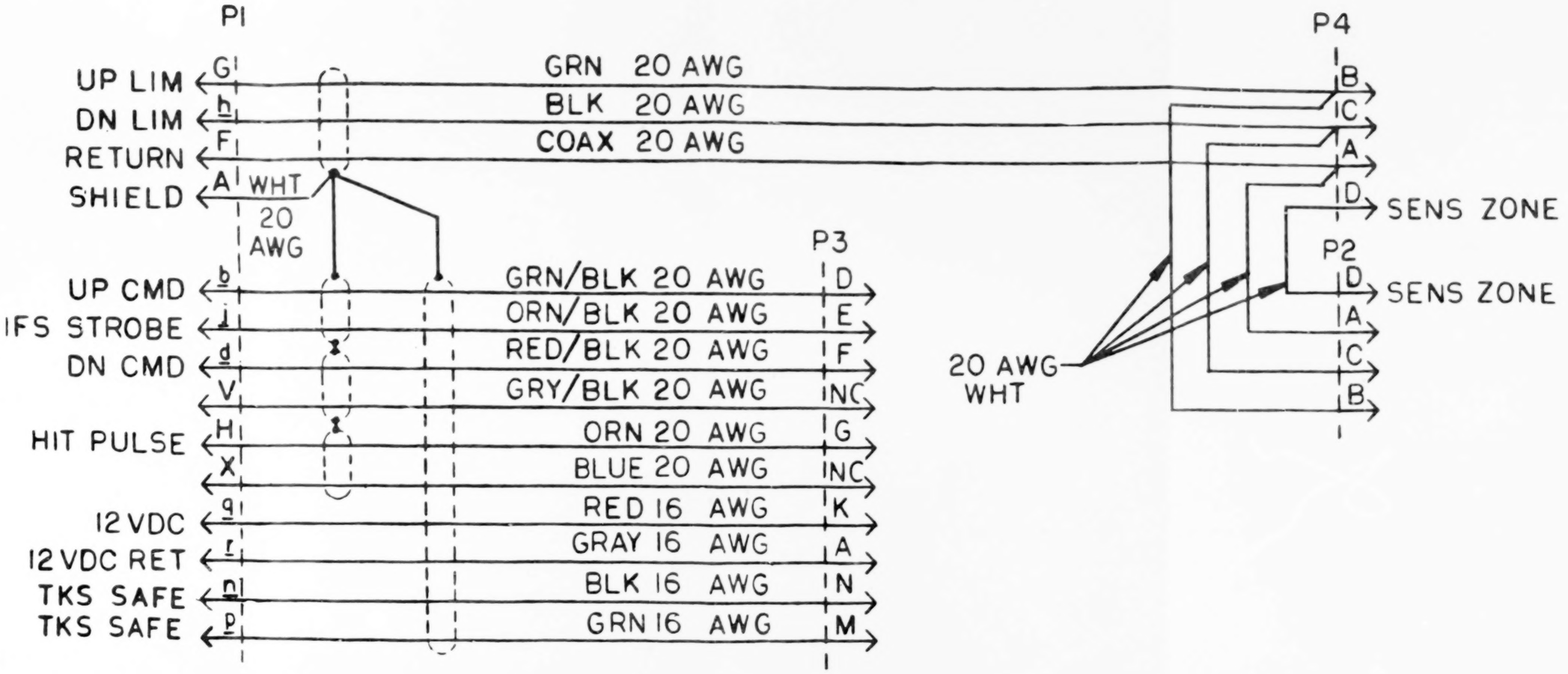


Figure FO-16. THM/TG and RETS Interface Cable Wiring Diagram